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ROYAL BOTANIC GARDENS, KEW

XX.—THE FLORA OF WEST TROPICAL AFRICA.

The publication of a new Flora relating to West Tropical Africa from the Royal Botanic Gardens requires some explanation as to the history of this new enterprise and as to its purpose. These matters have been fully explained in the Preface and it therefore seems fitting to reproduce it in this announcement of the publication of the first part of Volume I of the new Flora.

Preface

When the first volume of the "Flora of Tropical Africa" was published in 1868, under the Editorship of Prof. D. Oliver, the interest of Great Britain in the Economic possibilities of the West African Colonies in respect to the vegetable kingdom was but in its infancy, nor at that early date did we possess a very extensive knowledge of the Tropical African flora. Volumes II and III, published in 1871 and 1877 respectively, which included the Families as far as the end of the *Ebenaceae*, suffered from the same limitations. Since their issue so much new material has been collected in all parts of Tropical Africa, and particularly in the Western Colonies, that these early volumes are now quite out of date, especially in relation to the trees and shrubs, many of which, as for example the West African "Mahoganies," yield timber of great economic importance.

The publication of the "Flora of Tropical Africa" was continued, after an interval of twenty years, under the Editorship of Sir W. T. Thiselton-Dyer, when Vol. VII, *Hydrocharideae-Liliaceae*, was published in 1897, and in the Preface to that volume Sir William gives the history of the renewal of the undertaking.

Further volumes have been published from time to time since that date, and only the final parts dealing with the rest of the *Gramineae* now remain to be published.

The approaching completion of this great work, only the latter portions of which are now fairly abreast of modern knowledge, has relieved Kew of a great and laborious task, and has allowed attention to be directed to the particular needs of our Colonies situated on the western and eastern sides of the African Continent.

The "Flora of Tropical Africa" is so large a work, and covers so wide an area, that it cannot be used for the determination of plants in the field with any facility; it was felt, therefore, that the best interests of scientific workers could be served by the publication of

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regional Floras dealing with some one district and exhibiting a fairly homogeneous floral character.

Our West African Colonies of the Gambia, Sierra Leone, the Gold Coast and Nigeria, including the British sphere of the Cameroons and the adjacent French and Portuguese possessions, were considered to afford a very suitable region for such a local or regional Flora; the project was, therefore, brought to the notice of the Secretary of State for the Colonies, the history of the present undertaking being given in the following letters :—

Royal Botanic Gardens, Kew,
November 25th, 1922.

SIR,

FLORA OF TROPICAL AFRICA

In the year 1909 the Secretary of State for the Colonies authorised the employment of an Assistant for Tropical Africa in the Herbarium at Kew, and the appointment was in the first instance for a period of five years, as from 1st April, 1909, and was renewed for a further period of three years up to 31st March, 1917. . . .

The impending completion of the " Flora of Tropical Africa " induces me to bring to the notice of the Secretary of State a project which for some years has occupied the attention not only of my predecessors and myself, but of the Governors and Scientific Officers of our West African Colonies, and that is the urgent need of a Handbook dealing with the Floras of West Africa, which would form a valuable and most useful work of reference for the Botanical, Forestry and Agricultural Officers in Nigeria, the Gold Coast, Sierra Leone, and the Gambia.

The position of affairs with regard to the Tropical African Flora is closely paralleled by the case of the " Flora of British India," which was also compiled at Kew, under the Editorship of Sir Joseph Hooker.

On the completion of that work the need of Floras dealing with special areas was at once realised, and as a result the Government of India arranged for the preparation of the Floras of Bombay, Madras, the Gangetic Plain, etc., which are now either wholly or very nearly completed.

These " local " Floras have been or are being written by distinguished Indian Botanists, and the work has been done almost entirely at Kew, the Government of India finding the necessary funds for the purpose.

I may, perhaps, also refer to the case of the Dictionary of the Economic Products of India by Sir George Watt, Reporter on Economic Products to the Government of India, and to the concise Handbook based upon the Dictionary of the Commercial Products of India which was prepared by him mainly at Kew, as well as to the analogous " Useful Plants of Nigeria " prepared at Kew by one of our Assistants, who had previously served as an official in Nigeria, which has been found of so much value in our West African Colonies

as a work of reference dealing with the Economic Products of West Africa.

This latter work, however, useful as it is, is only of full value provided the plants are known and can be easily identified by those who wish to consult it.

The need in West Africa now is a concise and easily workable "Handbook of the Flora" on the lines of one of the Indian Floras to which I have referred, which could be used by anyone who had a reasonable knowledge of plants—though not necessarily a Botanist by profession. Such a Handbook would provide information as to the plants of value as foods, drugs, fibres, timber, and minor forest products, and would also include the local fodder grasses, which should be easily available for use by veterinary officers.

The "Flora of Tropical Africa," essential though it is for the study of the Tropical African Flora as a whole, is not an easy work of reference in the field owing to its magnitude, and it also suffers in value owing to the fact that since the earlier volumes were written so much new material has come to hand, especially from Nigeria, the Gold Coast and Sierra Leone, that there is a great deal of supplementary matter unavailable to workers in the field, which it is most desirable, in the interests of these Colonies, should be published.

I venture to bring the need of a Flora of West Africa or Upper Guinea to the notice of the Secretary of State at the present moment, partly because the "Flora of Tropical Africa" is so nearly completed, but more especially because I learn that there is an officer available to undertake the preparation of a "local" Flora of exactly the type which would be of the greatest service to our West African Colonies.

The officer to whom I refer is Dr. J. M. Dalziel, M.D., B.Sc., F.L.S., whose Hausa Botanical Dictionary is so well known and has proved of so much value in our West African Colonies. . . .

I beg to request, therefore, that if my proposal should meet with the favourable consideration of the Right Honourable the Secretary of State, the Governors of the West African Colonies may be approached and asked whether they would be prepared to provide the necessary funds for the preparation of the Flora of the West African Colonies on the lines I have indicated.

Since a work of this kind would be of so great value to our West African Colonies I hope the Secretary of State may feel disposed to commend the proposal to their earnest consideration.

I am, etc.,
ARTHUR W. HILL,
Director.

The Under-Secretary of State,
Colonial Office, S.W. 1.

Downing Street,
26th January, 1923.

SIR,

I am directed by the Duke of Devonshire to acknowledge the receipt of your letter of the 25th of November relative to the prepar-

ation of a Handbook of the Flora of West Africa, and to inform you that copies have been forwarded to the Governors of the West African Colonies for their consideration.

2. A further communication will be addressed to you when their replies have been received.

I am, etc.,
(Sd.) H. J. READ.

The Director,
Royal Botanic Gardens.

Downing Street,
12th June, 1923.

SIR,

With further reference to your letter of the 25th of November, I am directed by the Duke of Devonshire to inform you that the replies which he has received to his despatch indicate that the West African Governments agree to your proposal that provision should be made for the compilation of a " Flora of West Africa " by a retired West African officer.

2. His Grace would accordingly be glad if you make the necessary arrangements for this project to be put into effect, and approves of your employing Dr. J. M. Dalziel or any other person who would in your opinion be able satisfactorily to undertake the work.

I am, etc.,
(Sd.) H. J. READ.

The Director,
Royal Botanic Gardens.

On receipt of the Colonial Office letter sanctioning the proposal Dr. J. M. Dalziel was duly appointed Assistant for West Africa at Kew and the work on the " Flora of West Africa " was commenced in September, 1923.

Mr. J. Hutchinson, a member of the Kew staff, who has for many years made a special study of the West African Flora, was appointed by the Director to take charge of the work and write the Flora in collaboration with Dr. Dalziel.

The combination of a botanist possessing a wide knowledge of the systematic principles of the science with one familiar with the general aspect of the vegetation in the field has proved to be very useful, and it is hoped that the resulting Flora will be found of value by professional botanists, foresters, agriculturists, and by all who take an intelligent interest in the plant life of West Africa.

In due course it is hoped that it will be made possible to provide a similar work dealing with the Floras of our Tropical East African Colonies as the second in this series of handy regional Floras.

The present work differs in three important respects from all those of the long series of Colonial Floras which previously have emanated from the Royal Botanic Gardens, Kew.

In the first place it is arranged on a new system of classification ; secondly, it is provided with illustrations of the Families, as represented by the more important genera, which should considerably enhance its value ; and thirdly, the descriptions of the actual plants are reduced to a minimum and the text is mainly in the form of a descriptive " key," in order to facilitate easy and rapid determination of the species.

The system of classification adopted in this Flora is that published by Mr. Hutchinson in his recent book " The Families of Flowering Plants," which, while it follows the main lines of Bentham and Hooker's " Genera Plantarum," differs in some important respects from that classic work, which is the standard of the arrangement in the Kew Herbarium.

The changes involved in the new system seem desirable and worthy of being followed in this Flora, since they embody the results of the new light that recent research has thrown on the inter-relationships of the various Families of the Flowering Plants. The system has also been followed in Burtt Davy's " Flora of the Transvaal," now in course of publication.

The carefully compiled Key to the Families should enable students to determine the position of any particular plant with ease and rapidity, and having ascertained the Family, the brief descriptions drawn up in Key form should enable the species to be determined with equal ease.

The Key principle adopted in this Flora has been found eminently satisfactory in the late Mr. J. S. Gamble's " Flora of Madras " and other Indian regional Floras.

The illustrations with which the Flora is provided have all been prepared especially for the purpose and give all those details which should be of value both to the botanist and the amateur.

Kew is indebted to the numerous botanists, agricultural, forest and medical officers and other Government officials in our West African Colonies for many of the specimens which are recorded in the Flora. Many political officers, amateur botanists and travellers have also enriched our collections, and reference is made to the principal collectors in the opening pages of the Flora, under the heading Botanical Exploration in West Africa.

Kew is particularly indebted to Prof. H. Lecomte, Director, Muséum d'Histoire Naturelle, and to Dr. A. Chevalier, Director, Laboratoire d'agronomie coloniale, Paris, for the loan of specimens, especially from the French Possessions in West Africa, and for the facilities given for the study of the collections in Paris, and to Dr. L. Diels, Director of the Botanic Garden and Museum, Dahlem, Berlin, for the loan of many type specimens.

To these botanists, and to the many others who have generously assisted Kew in supplying specimens and information, I wish to

record my sincere thanks, as without their aid the work would have lacked the measure of completeness which it has been possible to achieve.

ARTHUR W. HILL.

Royal Botanic Gardens, Kew,
January, 1927.

This first part, which consists of 246 pages, contains the families *Cycadaceae–Tiliaceae*, inclusive. The work opens with a short introduction dealing with the geographical area covered, which is also illustrated by a sketch map of West Tropical Africa. This is followed by an account of botanical exploration in West Africa, which commenced with the work of Adanson (1749–54), whose name is commemorated in the frontispiece of *Adansonia digitata*. A bibliography of works dealing with West African Botany is also given.

A glossary of botanical terms is followed by a key to the families of Dicotyledons represented in the Flora, and the families contained in Volume I are then set out in the Phylogenetic sequence adopted in the Flora. The descriptive matter, or Flora proper, commences on p. 45 and opens with the Gymnosperms, which are represented in West Tropical Africa by the single Cycad *Encephalartos Barteri* and by *Gnetum Buchholzianum*. The Angiosperms then follow, commencing with the *Anonaceae*.

As has been stated in the Preface the descriptions are concise and arranged on the key system, so that it should be possible for workers in the field to determine their plants with a minimum of trouble. It is also hoped that the numerous and clear text-figures will considerably enhance the value of the Flora.

The work is published by the Crown Agents for the Colonies, the first part being priced at 8s. 6d.

XXI.—TROPICAL AFRICAN PLANTS: I. J. HUTCHINSON and J. M. DALZIEL.

In order to preserve uniformity and avoid the use of Latin descriptions in the "Flora of West Tropical Africa" the new species and combinations included in the first part of that work were referred to the *Kew Bulletin*. These will appear at intervals under the above title, together with supplementary notes for which there was no place in the *Flora*. The sequence of the families will be the same as that adopted in the *Flora*.

ANONACEAE.

Uvaria Mannii *Hutch. et J. M. Dalz.*, sp. nov., affinis *U. angustifoliae* Engl. et Diels, sed foliis elongato-ellipticis basi obtusis apice acuminatis nervis lateralibus utrinsecus 14 infra prominentibus differt.

Ramuli glabri, leviter flexuosi, internodiis circiter 1·5 cm. longis. *Folia* elongato-elliptica, basi obtusa vel rotundata, breviter acuminata, circiter 16 cm. longa et 6·5 cm. lata, utrinque glabra, supra nitida; nervi laterales utrinsecus circiter 14, supra prominuli, infra prominentes, marginem versus conspicue conjuncti; petioli 5–10 mm. longi, supra profunde canaliculati. *Flores* in ramis efoliatis subsessiles. *Sepala* triangularia, 5 mm. longa, extra appresse pilosa. *Petala* 6, aequilonga, ovata, extra et intra apicem versus tomentella, circiter 1·5 cm. longa et 1·3 cm. lata.

Fernando Po: "shrub 5–7 m. high, calyx green, corolla white with four dark purple spots at the base inside"; *Mann* 257 (type).

Uvaria Farquharii *Hutch. et J. M. Dalz.*, sp. nov., ramulis reflexis reticulato-areolatis, foliis ellipticis emarginatis distincta.

Ramuli mox reflexi, conspicue reticulato-areolati, patule rufo-pubescentes vel hirsuti, internodiis circiter 2 cm. longis. *Folia* elliptica, apice rotundata et emarginata, basi subcordata, 4–6·5 cm. longa, 2·5–4 cm. lata, supra leviter pustulata, infra tenuiter fusco-pubescentia; nervi laterales utrinsecus circiter 6, arcuati, marginem versus evanidi; petioli 2–3 mm. longi, dense hirsuti. *Sepala* late triangularia, 2·5 mm. longa, extra tomentosa. *Petala* lata, 1·5 cm. longa, extra stellato-tomentella. *Carpella* fructifera juniora elliptica, stipitata, glabra.

Nigeria: Southern Provinces; Ukete, Sept., *Farquhar* 73 (partly) (type).

Pachypodanthium Barteri *Hutch. et J. M. Dalz.*, comb. nov. *Anona Barteri* Benth. in Trans. Linn. Soc. 23: 477 (1862); Oliv. Fl. Trop. Afr. 1: 17.

Nigeria: Southern Provinces; Onitsha; "tree 50 ft.; leaves bright shining; fruit size of a peach"; *Barter* 445 (type).

The above was included by Oliver (l.c.) amongst the imperfectly known species of *Anona*. Engler and Diels make no mention of it in their monograph.

Piptostigma giganteum *Hutch. et J. M. Dalz.*, sp. nov., foliis magnis, sepalis ovato-triangularibus petalis interioribus late lanceolatis nervosis distincta.

Arbor; ramuli teretes, rufo-tomentosi. *Folia* magna, late elliptica, basi rotundata, usque ad 35 cm. longa et 25 cm. lata, infra glauca et parce pubescentia; costa infra prominens et tomentosa; nervi laterales utrinsecus circiter 30, patuli, infra prominentes, nervis tertiariis numerosis parallelis gracilibus. *Inflorescentia* usque ad 20 cm. longa, tomentosa. *Sepala* et petala exteriora subaequalia, ovato-triangularia, acuminata, 7–8 mm. longa, extra dense appresse villosa; petala interiora late lanceolata, circiter 5 cm. longa, extra conspicue nervosa et villoso-pubescentia, intra molliter stellato-pubescentia. *Carpella* fructifera stellate disposita, sessilia, obtuse rostrata, costata, circiter 2·5 cm. longa.

Nigeria: Southern Provinces; Oban, *Talbot* 1336 (type).

Hexalobus glabrescens *Hutch. et J. M. Dalz.*, sp. nov., affinis *H. monopetalo* Engl. et Diels, sed foliis mox glabrescentibus apice obtusis vel rotundatis, ramulis glabrescentibus differt. *H. monopetalus* var. *parvifolius* Bak. f. in Cat. Talb. Nig. Pl. 5 (1913).

Arbor usque ad 12 m. alta; ramuli flexuosi, foliosi, purpurascentes, primum appresse pubescentes, demum glabri et verrucosi. *Folia* anguste oblonga, utrinque rotundata, apice interdum emarginata, usque ad 15 cm. longa et 4·5 cm. lata, plerumque 3 cm. longa, primum minute pubescentia, mox glabrescentia; nervi laterales supra prominuli, infra inconspicui; petioli 2–3 mm. longi, tomentelli. *Flores* sessiles, parvi, flavi. *Sepala* ovata, coriacea, 5 mm. longa et 4 mm. lata, extra dense flavido-tomentella. *Petala* basi connata, alabastro corrugata, late elliptica, circiter 1 cm. longa et 6–7 mm. lata, medio basin versus appresse villosa, ubique minute pubescentia. *Fructus* ovoideus vel cylindricus, aurantiaca, circiter 3·5 cm. longus et 1·5 cm. crassus, minute rufo-tomentellus.

Nigeria: Northern Provinces; Yola, "shrub or tree of 15 ft.", *Dalziel* 205; "tree 40 ft. high", *Shaw* 103. Cameroons: Jauja-Berge, about 900 m., *Mildbraed* 9716; Bosum, 700–800 m., *Mildbraed* 9728; Lere to Ham, *Talbot* 531 (type). Chad Region: around Lake Iro, *Chevalier* 9099. Upper Shari: Gribingui district, *Chevalier* 6486.

Xylopia Vallotii *Chipp* ex *Exell* in Journ. Bot. 1926, Suppl.: 8. *X. parviflora* Vallot in Bull. Soc. Bot. Fr. 29: 219; Engl. et Diels in Engl. Monogr. Afr. Anonac. 64, nec Spruce, nec Pierre.

Senegambia: *Perrottet* 7 (type). Sierra Leone: bank of Moa river at Koteimahun, *Lane-Poole* 347; near Port Lokko, *Scott Elliot* 5730; Laminaiya, *Thomas* 144. Dahomey: Ouémé river, *Chevalier* 23586. Nigeria: Southern Provinces; various localities, *Vogel* 103; *Foster* 99; *Rowland*. Northern Provinces; various localities, *Barter* 426; 1035; *Dalziel* 103; 713; *Elliott* 171. Belgian Congo: *Smith*; *Bequaert* 2281. Portuguese Congo: Sumba; Peco, *Gossweiler* 8658; 8937.

Popowia Dalzielii *Hutch.*, sp. nov., affinis *P. Mannii* Baill., sed floribus solitariis vel geminatis, foliis late et subabrupte acuminatis differt.

Scandens; ramuli laterales basi interdum tendriliformes, flexuosi, areolato-reticulati, glauco-purpurei. *Folia* elliptico-obovata, late et subabrupte acuminata, basi rotundata, 10–15 cm. longa, 3·5–5·5 cm. lata, glabra vel minute pubescentia, infra glauca et crebre reticulata; nervi laterales utrinsecus 6–7, arcuati, infra prominentes et brunnescentes; petioli 3–4 mm. longi, supra plani. *Flores* axillares, plerumque geminati; pedicelli graciles, 1 cm. longi, breviter pubescentes. *Sepala* late triangularia, 1·25 mm. longa, parce pubescentia. *Petala* exteriora ovata, crassa, 3 mm. longa, puberula.

Nigeria: Northern Provinces; Abinsi, July, *Dalziel* 712 (type). Southern Provinces; Olokemeji, *Foster* 312.

A specimen collected by Zenker (No. 2102A) from Bipinde, Cameroons, may also belong here. There are no flowers on the Kew sheet.

Oxymitra glaucifolia *Hutch. et J. M. Dalz.*, sp. nov., foliis infra conspicue glaucis valde distincta.

Ramuli breviter pubescentes. *Folia* oblonga vel oblongo-obovata, basi cordata, apice longe acuminata, 10–25 cm. longa, 4–7 cm. lata, supra glabra, infra glauca, nervis lateralibus utrinsecus 8–12 puberulis, nervis tertiariis gracilibus parallelis; petioli 0·5–1 cm. longi, breviter pubescentes. *Flores* magni. *Sepala* late ovata, circiter 7 mm. longa, extra breviter ferrugineo-tomentella. *Petala* exteriora late ovata, velutino-tomentella, circiter 2 cm. longa, interiora paulo breviora glabra. *Fructus* breviter stipitatus, cylindricus, 1–2-spermus, medio leviter contractus, usque ad 2·5 cm. longus, breviter ferrugineo-tomentellus.

Nigeria: Southern Provinces; Oban, *Talbot* 403 (type); 1255.

Tetrastemma Bakerianum *Hutch. et J. M. Dalz.*, sp. nov., foliis longe acuminatis basi late rotundatis et subcordatis, floribus brevissime pedicellatis valde distincta.

Ramuli leviter flexuosi, cortice cinereo longitudinaliter verrucoso obtecti, primum minute puberuli. *Folia* elongato-oblonga vel oblanceolata, basi rotundata et leviter cordata, satis longe acuminata, 15–27 cm. longa, 4–7 cm. lata, glabra, infra laxe reticulata; nervi laterales utrinsecus circiter 12, infra prominuli; petioli crassi, 3 mm. longi, puberuli. *Flores* solitarii, in ramulos breves pustulatos e trunco dispositi, extra rosei, intra carminei; pedicelli circiter 0·5 cm. longi. *Sepala* 2, parva. *Petala* lineari-lanceolata, acuta, crassa, 1·5–2 cm. longa, extra strigoso-pubescentia.

Nigeria: Southern Provinces; Oban, *Talbot* 1517 (type).

Monodora Unwinii *Hutch. et J. M. Dalz.*, sp. nov., petalis aequilongis, interioribus late obovatis, distincta.

Arbor; ramuli foliosi brevissimi, flexuosi, glabri, glauci. *Folia* oblongo-oblanceolata, basi rotundata, apice obtusa, 6–12 cm. longa, 3–4·5 cm. lata, glabra, infra leviter glauca; nervi laterales circiter 15, ascendentes; petioli glauci. *Pedicelli* circiter 5 cm. longi. *Sepala* triangulari-ovata, 1·3 cm. longa. *Petala* interiora quam exteriora crispata aequilonga vel longiora, late obovata, circiter 2·5 cm. longa, marginem versus piloso-setosa. *Ovarium* ovoideum, glaucum.

Nigeria: Southern Provinces; Benin, *Unwin* 45 (type).

LAURACEAE.

Tylostemon macrophyllus *Hutch. et J. M. Dalz.*, sp. nov., floribus minimis, foliis infra minutissime punctulata distincta.

Ramuli glabri. *Folia* alterna, elongato-obovato-elliptica, late acuminata, basi late cuneata, circiter 25 cm. longa et usque ad 11 cm. lata, tenuiter chartacea, utrinque laxe reticulata, infra minutissime punctulata; petioli circiter 1 cm. longi. *Inflorescentia* extra-axillaris, gracilis, laxe cymosa, ubique brevissime et parce pubescens; pedicelli graciles, 2·5 mm. longi. *Calyx* circiter 1·5 mm. longus, ad medium lobatus, lobis ovatis marginatis brevissime ciliolatis.

Nigeria: Southern Provinces; Oban, *Talbot* 2301 (type); 2302.

RANUNCULACEAE.

Thalictrum Mannii *Hutch.*, sp. nov.; a *T. rhynchocarpo* Dillon. et A. Rich., staminibus 7–8 leviter exsertis differt. *T. rhynchocarpum* Oliv. in Fl. Trop. Afr. 1: 8, partim, non Dillon. et A. Rich.

Herba usque ad 4 m. alta, glabra. *Foliola* ambitu late ovata vel orbiculari-obovata, basi plus minusve cordata, profunde crenata vel sublobulata, usque ad 1·3 cm. longa et lata, venosa, supra venis impressis infra prominulis. *Panicula* laxissima, leviter foliosa, late pyramidata; pedicelli gracillimi, 2–3 cm. longi, fructu demum usque ad 10 cm. longi. *Sepala* parva, viridescentia, obovata, 2 mm. longa. *Stamina* 7–8, leviter exserta. *Fructus* valde costatus, utrinque attenuatus, stylo persistente incluso circiter 1·5 cm. longo.

Nigeria: Southern Provinces; Cameroons Mt., 2400 m., fr. Nov., *Mann* 1999. Buea, *Deistel* 644. Fernando Po: 2000 m., *Mann* 293 (type).

Clematopsis nigerica *Hutch.*, sp. nov., affinis *C. Oliveri* Hutch., sed foliolis minus dentatis, foliis superioribus simplicibus, floribus solitariis differt.

Herba erecta, usque ad 35 cm. alta; caules simplices, profunde sulcati, internodiis elongatis. *Folia* inferiora pinnata, usque ad 15 cm. longa, foliolis lateralibus oblongo-lanceolatis paucidentatis utrinque parce pubescentibus infra laxe nervoso-reticulatis, foliolo terminale obovato-oblanceolato plus minusve petiolulato. *Flores* solitarii, terminales, longe pedunculati, pedunculo usque ad 15 cm. longo sulcato pubescente. *Sepala* 4, late elliptica, circiter 3 cm. longa et 1·5 cm. lata, utrinque molliter tomentosa. *Filamenta* pubescentia; antherae 5 mm. longae. *Carpella* longe villosa.

Nigeria: Northern Provinces; Vom, Bauchi Plateau, 950–1400 m., *Dent Young* 1.

MENISPERMACEAE.

Synclisia ferruginea *Hutch. et J. M. Dalz.*, comb. nov. *Synclisia scabrida* Diels in Engl. Pflanzenr. Menispermac. 87, partim, non Miers. *Anisocycla ferruginea* Diels l.c. 92 (1910).

Ramuli obscure costati, internodiis elongatis, pilis reflexis ferrugineis dense induti. *Folia* ovato-lanceolata, basi cordata, apice acuminata et pilis fasciculatis apiculata, 15–18 cm. longa,

circiter 7 cm. lata, basi 5-nervia, laxe transverse nervosa, costa nervis pilosis exceptis glabra, infra minute et crebre venulosa; petioli 2–3 cm. longi, patule hirsuti. *Flores* non visi. *Drupae* ellipsoideae, 2 cm. longae, 1·5 cm. latae, dense villoso-hispidae.

French Guinea: between Lola and Nyo, Mar., *Chevalier* 20989. Sierra Leone: Without definite locality, *Buckley* in *Scott Elliot* 5751. Liberia: Grand Bassa, fr. Aug., *Dinklage* 1686 (type). Ivory Coast: foot of Mt. Nouba, Apr., *Chevalier* 21134. Upper Nuon, Apr., *Chevalier* 21157.

Rhigiocarya Chevalieri *Hutch. et J. M. Dalz.*, sp. nov., affinis *R. racemiferae* Miers, sed foliis ovato-ellipticis ad basin rotundatum leviter angustatis apice obtuse caudato-acuminatis 7–9 cm. longis 4–5 cm. latis basi 3-nervis, petiolo usque ad 6 cm. longo, infructescentia 5–6 cm. longa, pedicellis 7–8 mm. longis differt.

Ivory Coast: Soubré, May, *Chevalier* 16404. Guidéko, May, *Chevalier* 16463. Lower Cavally river, Tate village, Aug., *Chevalier* 19810. Lower Cavally, Aug., *Chevalier* 19846.

Dioscoreophyllum fernandense *Hutch. et J. M. Dalz.*, sp. nov., caulibus pilis setosis, foliis parvis integris acute acuminatis distincta.

Scandens, usque ad 3 m. longa; caules graciles, pilis setosis induti, demum glabrati. *Folia* late ovata, basi aperte cordata et 5-nervia, apice abrupte caudato-acuminata, 6–7 cm. longa, 3–5 cm. lata, discoloria, utrinque nervis parce setosis exceptis glabra, infra pallidiora; petioli 3–4 cm. longi, basi spiraliter torti, parce setulosi. *Racemi* circiter 13 cm. longi, inferne setoso-pilosi; pedicelli patuli, usque ad 4 mm. longi, glabri; bracteae lineares, demum reflexae, 1·5 mm. longae. Fl. ♂: *Sepala* elliptica, glabra, 2 mm. longa. *Petala* nulla. *Stamina* 6, in synandrium depressum connata. Fl. ♀ non visi.

Fernando Po: climbing plant 6 ft. long, calyx green, stamens light red, June, *Mann* 416.

Tiliacora Dielsiana *Hutch. et J. M. Dalz.*, sp. nov., affinis *T. Lehmbachii* Engl., sed inflorescentiis axillaribus, foliis late ellipticis differt.

Ramuli crebre longitudinaliter sulcati, glabri. *Folia* late elliptica, basi rotundata, apice triangulari-acuminata, mucronata, 10–15 cm. longa, 5–7 cm. lata, basi 5-nervia, utrinque conspicue reticulata; petioli 1·5 cm. longi, apicem versus leviter incrassati. *Flores* cymosi, cymulis pedunculatis subcapitatis, pedunculis circiter 1 cm. longis tomentellis. Fl. ♂: *Sepala* exteriora bracteiformia, triangularia, ciliolata, interiora obovato-oblanceolata, sicco nigrescentia, 4 mm. longa, glabra. *Petala* minuta. *Stamina* 6, filamentis circiter ad medium connata. Fl. ♀ non visi.

Sierra Leone: Kuntara, June, *Thomas* 465 (type); *Thomas* 9899.

Triclisia Dielsii *Hutch. et J. M. Dalz.* ex *Exell* in Journ. Bot. 1926, Suppl.: 13, in obs. (nomen); affinis *T. subcordatae* Oliv.,

sed foliis basi rotundatis infra longe villosis, petiolis brevioribus differt.

Ramuli leviter flexuosi, pilis reflexis flavidis dense induti. *Folia* late oblongo-elliptica, abrupte longe mucronato-acuminata, basi rotundata, 7–8 cm. longa, 4–5 cm. lata, supra nitido-reticulata, demum glabra, infra appresse villosa; nervi laterales utrinsecus circiter 3–4, infra prominentes; petioli 2–2·5 cm. longi, dense hirsuti. *Cymae* ♂ axillares, brevissime pedunculatae vel subsessiles, ubique adpresse tomentosae; flores in cymis subsessiles. *Sepala* exteriora minuta, bracteiformia, gradatim majora, ultima late elliptica, fere 3 mm. longa. *Stamina* 6, libera, arcuata, acuta. *Axis* breviter productus, vertice pilorum fasciculo hirsutus. *Flores* ♀ non visi.

Dahomey: near Lome, *Warnecke* 327 (type).

Syntriandrum cordatum *Hutch. et J. M. Dalz.*, sp. nov., ob folia simplicia basi cordata exauriculata satis distincta.

Caules glabri, sulcati. *Folia* simplicia, ovata, basi cordata, apice late acuminata et mucronata, circiter 12 cm. longa et 7–8 cm. lata, basi 5-nervia, nervis lateralibus utrinsecus 3–4, utrinque prominente reticulata; petioli 4·5–5 cm. longi, basi leviter torti, glabri. *Inflorescentia* elongata, gracillima, usque ad 35 cm. longa, glabra; ramuli laterales simplices, patuli vel leviter reflexi, usque ad 10 cm. longi. *Flores* minutissimi, glabri, juniores tantum visi.

Nigeria: Southern Provinces; Calabar, *Williams* 28 (type).

Kolobopetalum leonense *Hutch. et J. M. Dalz.*, sp. nov., affinis *K. ovato* Stapf, sed inflorescentiae axi brevissimo, foliis basi cordatis differt.

Frutex scandens; rami leviter spiraliter torti, glabri. *Folia* ovato-elliptica, basi cordata, abrupte acuminata, acumine mucronato, 12–15 cm. longa, 7–8 cm. lata, basi prominenter trinervia, glabra, nervis lateralibus utrinsecus circiter 3 marginem versus ramosis infra prominentibus; petioli 8–10 cm. longi, basi torti, apice incrassati et transverse rugosi. *Inflorescentiae* axillares, simpliciter ramosae, axibus primariis abbreviatis usque ad 2 cm. longis, ramis lateralibus elongatis usque ad 18 cm. longis glabris; pedicelli 2 mm. longi, apice demum articulati, persistentes. *Sepala* 3 exteriora minima, ovata, 3 interiora suborbicularia, 2 mm. lata, glabra. *Petala* 6, biseriata, exteriora truncato-emarginata, interiora apice late rotundata, subcarnosa. *Stamina* 6, exteriora 3 libera, interiora 3 connata. *Flores* ♀ non visi.

Sierra Leone: Without locality, *Thomas* 3858 (type).

Penianthus patulinervis *Hutch. et J. M. Dalz.*, sp. nov., nervis lateralibus supra elevatis distincta. *P. longifolius* A. Chev. Explor. Bot. Afr. Occ. Franç. 19, non Miers. *P. Zenkeri* Diels in Engl. Pflanzenr. Menispermac. 101, partim.

Frutex vel arbor parva; ramuli glabri. *Folia* obovato-oblanceolata, ad basin longe cuneata, subsensim caudato-acuminata, obtusa, 10–18 cm. longa, 3·5–9 cm. lata, chartacea, glabra, nervis lateralibus utrinsecus circiter 10 a costa angulo 45° abeuntibus utrinque elevatis marginem versus conspicue conjunctis nervis tertiariis paucis laxe reticulatis; petioli 1·5–4 cm. longi, basi et apice conspicue pulvinati. *Flores* non visi. *Drupae* anguste ellipsoideae, 3·5 cm. longae, 1–1·5 cm. latae, glabrae et nitidae, rubrae.

Sierra Leone: Keneme, fr. Jan., *Thomas* 7650a; 7991. Ivory Coast: various localities, *Chevalier* 15263; 15436; 15507; 15583; 16680; 16965; 17026; 17163; 17620; 17843; 17856; 17904; 17985; 19621; 22287. Gold Coast: Kumasi, fr. Jan., *Cummins* 169; 190 (type).

Penianthus fruticosus *Hutch. et J. M. Dalz.*, sp. nov., affinis *P. longifolio* Miers, foliis ellipticis basi obtuso rotundatis, nervis lateralibus utrinsecus 6–8 differt. *P. longifolius* Diels in Engl. Pflanzenr. Menispermac. 101, partim, non Miers.

Frutex circiter 1 m. altus; ramuli minute verruculosi. *Folia* elliptica, basi rotundata, apice obtuse caudato-acuminata, 10–18 cm. longa, 4·5–8 cm. lata, glabra, opaca, nervis lateralibus utrinsecus 7–8 supra impressis infra prominentibus prope marginem conjunctis; petioli usque ad 5 cm. longi, basi et apice pulvinati. *Inflorescentiae* ♂ e ramis efoliatis ortae, capituliformes, brevissime pedunculatae, circiter 7 mm. diametro. *Sepala* 5–6, glabra. *Stamina* 5–6. *Fructus* non visus.

Cameroons Mt.: 160 m., "small shrub about 3–4 ft. high," fl. Jan. *Mann* 1205 (type).

XXII.—THE VARIABILITY OF THE CAMPHOR TREE IN FORMOSA. F. N. Howes.

For many years it has been known that the common camphor tree (*Cinnamomum Camphora* Nees) is very variable in its yield. In some areas a high proportion of solid camphor accompanied by only a small amount of camphor oil results on subjecting any part of the tree—root, stem, or leaves—to steam distillation. It may be found elsewhere that only a small percentage of solid camphor along with large quantities of camphor oil are derived from distillation, or possibly oil only with no sign of solid camphor may be obtained. In the island of Formosa, which produces the bulk of the world's supply of camphor, this variation in yield of solid camphor is well known, but has recently been shown to be of a more complex nature than was formerly thought to be the case. Apart from this variation in the percentage yield of solid camphor great variation has been found to exist in the nature of the oils produced. Investigations in Formosa have shown that the oil

obtained from camphor trees which yield no solid camphor may belong to any one of three or more distinct types of oil, distinct from one another in physical properties and chemical composition. The existence in British Possessions of trees which yield oil only, notably trees in Mauritius, Dominica and St. Vincent, was dealt with in *Kew Bulletin*, 1921, pp. 129-135. Here no mention was made of the nature of the oil from these trees, and it was generally assumed at that time that such oils were analogous with true camphor oil, i.e., that obtained along with solid camphor in camphor distillation.

Oil-Yielding Trees.

Discussion in the present article is centred on those strains or races of *Cinnamomum Camphora* which do not yield solid camphor. With the exception of one of these, the "Shô-Gyū," the separate specific identity of which has now been established, all these "forms" or ecads of *Cinnamomum Camphora* -if they may be so termed—exhibit no outward morphological differences, and are botanically undoubtedly *Cinnamomum Camphora* Nees. The different "forms" might almost be regarded as separate physiological strains, except that as yet the extent to which climatic factors may influence their behaviour and the extent to which they breed true to type is not thoroughly understood.

The "Shô-Gyū" Tree (*Cinnamomum Kanahirai* Hay.) and its Oil.

The one exception referred to above is the tree producing the oil known in Formosa as, and described by Nagai* under the name of, "Shô-Gyū." It was formerly regarded as being *Cinnamomum Camphora* Nees, but has now been separated and described by Hayata† as a new species, *Cinnamomum Kanahirai* Hay.

The "Shô-Gyū" tree is said to exist in Formosa in more or less isolated belts parallel to but distinct from the areas of the true camphor tree. It occurs in mountain areas at altitudes of, roughly, from 5000 to 6500 feet : above this altitude the tree is displaced by Conifers. It is thought that it may later be found to extend all along the Central Mountain Range which runs north and south through Formosa. According to Nagai the trunk of the "Shô-Gyū" tree usually attains to a height of 40 to 50 feet, with a circumference at the base of from 15 to 20 feet. The tree is of rapid growth, and the trunks are generally entwined by lianes and covered with epiphytes. The bark is of a more brownish-red colour than that of true camphor, and the heartwood is whiter, while the wood is softer and more sappy and can be worked and chipped with ease. Although floral differences exist between "Shô-Gyū" and true camphor the trees are said to be outwardly very similar. In

* Investigations of the Shô-Gyū and Yu-Ju Oils produced in Formosa, by Kazuo Nagai. Monopoly Bureau, Govt. of Formosa. 1914.

† Ic. Pl. Formosa, iii, 159.

discussing a means of distinguishing "Shô-Gyū" from true camphor, in the absence of flowers, Nagai states, "The leaves of the 'Shô-Gyū' tree have a bright deep-green colour upon the surface and are much thicker than those of the camphor tree (a large one often measuring about 13 cm. in length and 4·5 cm. in width), and are slender in form with a particularly pointed apex which frequently reaches a length of 1 cm." He points out further that the terminal leaf buds of "Shô-Gyū" (1 cm. by ·5 cm. in diameter) are larger than those of true camphor. A test which can readily be accomplished and one commonly used by camphor-wood cutters in Formosa is to shave small pieces from the sap wood, especially from the root, when the distinctive odour of "Shô-Gyū" as compared with true camphor will be recognised.

The yield of "Shô-Gyū" oil is estimated to be on an average about 2·5 per cent. of the wood used. It is usually colourless or slightly yellowish, with optical rotation always dextro-rotatory. Regarding its components the existence, according to Nagai, of citronellol, geraniol, safrol, sabinene, dipentine, α and γ-terpinene, terpineol-4 and eugenol is definite, whilst linalool, cardinene and formaldehyde are probably also present. From this analysis the oil is stated to resemble cardamom oil and to possess features in common with savin, nutmeg and even juniper oil, indicating that the oil deserves recognition as a possibly important essential oil of the future.

The "Yu-Ju" Tree (*Cinnamomum Camphora* Nees) and its Oil.

This oil is yielded by a tree which, as already pointed out, is identical in external form with *Cinnamomum Camphora*. The tree is indigenous to southern Formosa, and is not found at all in the northern half of the island. Where it exists it is known to the natives as "Iu-chhiu" or "Yu-Ju," signifying "oil tree." It occurs in dense tracts in certain areas, one of the largest of which is situated just to the west of the Central Mountain Range and adjoining one of the most dense of the "Shô-Gyū" areas. In distinguishing "Yu-Ju" trees from those yielding true camphor the camphor workers rely, as in the case of "Shô-Gyū," solely upon the smell of shavings taken from the root. According to reports the existing stocks of true "Yu-Ju" trees in Formosa are not considered to be very large.

The percentage of oil obtained from the wood of "Yu-Ju" trees varies considerably, but generally ranges between 2 and 3 per cent., though yields as high as 5 per cent. and of less than 1 per cent. are recorded. "Yu-Ju" oil is generally of a light-yellow or golden colour or more rarely yellow-green. It resembles camphor oil closely in physical properties, but is weaker in optical activity. Amongst its components are numbered furfural, camphene, α-pinene, cineol, dipentene, α-terpineol, safrol and eugenol: probably other varieties of phenols and terpenes are also present. Richness in

cineol is the chief feature and characteristic of "Yu-Ju" oil and the main point of difference from camphor oil. An entire absence of linalool is another interesting feature and a strong point of contrast with "Shiu" oil, where linalool is always present.

Allied to true "Yu-Ju" is a form of "Yu-Ju" occurring in certain areas which yield small amounts of solid camphor with the "Yu-Ju" oil. It has been regarded as a distinct form and referred to as the "Yu-Ju Camphor Tree."

The "Shiu" Tree (*Cinnamomum Camphora*) and "Shiu" Oils.

The "Shiu" tree, identical botanically, as in the case of the "Yu-Ju" tree, with the true camphor tree, occurs in Formosa in broad-leaved forest areas, roughly from the centre to the north of the island. The word "shiu" is used in Formosa for both the tree and the oil, whilst it is commonly known to the Chinese as "Tswan Chiu," and to the Japanese as "Kusa-abura," signifying "ill-smelling oil," owing to its distinctive odour and the general idea held formerly that the oil was valueless. Outwardly "Shiu" and true camphor trees appear identical, and to distinguish between them when growing intermixed is a matter of difficulty, even for expert and experienced natives. Suggested points of dissimilarity are, that in the case of the "Shiu" trees there is a more open and ragged crown of leaves, giving the impression that the leaves would be less numerically per unit area, and that the leaves of "Shiu" fall earlier than do those of true camphor. However, the only sure method of distinction and the one used by natives is to crush the leaves and to distinguish by the odour, that of "Shiu" being peculiar and distinctive. This peculiar odour is attributed to the presence in "Shiu" oil of linalool and geraniol, substances never found in true camphor oil. Chips or shavings from the trunk or root can of course be distinguished in the same way.

"Shiu" trees and the fact that the wood yielded no camphor on steam distillation were well known to the old Chinese camphor workers, who being desirous of obtaining camphor left them entirely alone. Consequently in certain areas, owing to the continued cutting out of true camphor trees, the proportion of "Shiu" has become much greater than formerly. Some of the largest areas of "Shiu" are found in the mountainous areas in the extreme north of the island. Here "Shiu" trees are generally interspersed irregularly with a few trees of true camphor, and are most numerous in the lowermost slopes of the valleys.

The percentage of oil obtained from the tree may vary from 2 to as much as 9 per cent., being dependent upon what part of the tree is used in the distillation and the type of tree. It has been found that on an average the roots contain twice as much oil as does the trunk, whilst the oil distilled from the centre of the trunk is always heavier and less in quantity than that from the periphery. The greatest quantity of oil is obtained from the basal region of the trunk, the amount decreasing towards the branches, twigs and

leaves. The oil obtained from the leaves is reputed to be the finest-smelling and most fragrant.

"Shiu" oils exist in different forms according to the proportions of the various components present, but all possess the same characteristic odour. Linalool is always present in "Shiu" oils, but entirely absent in camphor oil. Although linalool is the chief constituent of most "Shiu" oils there are some, particularly those from the more southern limits of the "Shiu" areas, in which camphor may be present even to the extent of being in excess of the linalool. The presence of these two substances determines the optical activity of the oil, for those with a high proportion of linalool are strongly laevo-rotatory, whilst those with camphor in excess are dextro-rotatory. Laevo-rotatory "Shiu" oils are found mainly in the northern part of Formosa and dextro-rotatory ones in the centre of the island.

"Shiu" oils may vary in colour from pale-yellow to dark-brown, though they are almost colourless when pure. Besides linalool, and in less frequent cases camphor, other components of "Shiu" oil have been found to be pinene, cineol, dipentene, terpineol, geraniol, safrol, eugenol, cardinene, and lower aliphate aldehydes. The possible uses of "Shiu" oil are dependent upon whether linalool or camphor predominates in the oil. Uses for those with linalool in excess are as a basis for making pure linalool, various organic acid estyls, and citral oil. Those with a large proportion of camphor may be used as a source of crystalline camphor, separation being effected by fractional distillation, whilst the resulting light and heavy oils would be of the same nature as "white" and "red" camphor oils.

Factors influencing Nature of Yield of *Cinnamomum Camphora*.

To what extent climatic conditions may be responsible for the varying behaviour of *Cinnamomum Camphora* as exemplified above has been a matter of conjecture since the phenomenon first became known, and the fact established that it was *Cinnamomum Camphora* and not other species of *Cinnamomum* that were being dealt with. A study of the climatic conditions prevailing in Formosa and its topography, whilst throwing much light on the subject, fails to explain entirely the occurrence of these various forms. And whilst the belief that the problem can be explained away entirely on the basis of climate and environment is strengthened by the results of recent planting experiments in Formosa, there are at the same time sound arguments in favour of the opinion that it is more a question of heredity that is responsible for the variety of products yielded. It is proposed merely to mention briefly and discuss facts which appear to have a bearing on the subject.

In Japan trees of *Cinnamomum Camphora* yield camphor throughout, the various oil-yielding forms of Formosa being

non-existent there. The southernmost areas of Japan are at a latitude of 32° N. as against 22°-23° N. for those of Formosa, the latter being therefore within the Tropics and decidedly tropical in nature. This contrast in the behaviour of the camphor tree in Japan and in Formosa, combined with the fact that in certain other areas in the Tropics (e.g., Mauritius, St. Vincent, and Dominica), the camphor tree was found to yield oil only, led to the belief that possibly tropical conditions for some reason or other were inimical to the production of solid camphor by the tree. This idea, however, is now rather discredited by the fact that in most tropical countries where the camphor-yielding tree has been grown solid camphor has now been obtained. In some of these countries solid camphor and oil-yielding forms have been found to be present, growing at the same altitudes and under apparently identical conditions.

In southern Formosa areas have of late years been planted up with young camphor trees grown from seed from known solid-camphor yielding trees in Japan. It is now being found apparently that of these trees some yield oil only, while others yield solid camphor, and the former if anything preponderate. This points to climatic factors being the cause of trees producing oil only, which would normally—under their home conditions—yield camphor. It does, however, appear strange that some and not all the trees should be so affected.

Recent information from Formosa indicates that considerable variation in the oil of an individual tree may be found to exist, and that two of the distinct oils already described might be found in different parts of the same tree. For instance trees which yield camphor from one side of the trunk and "Yu-Ju" oil from the other have been noted, also trees yielding "Yu-Ju" on the one side and "Shiu" oil on the other. That such should be the case is remarkable, and, together with the fact that true camphor and some of the oil-yielding trees grow side by side in parts of Formosa, can hardly be accounted for by climatic influence. In Formosa a far greater proportion of the trees yield solid camphor in the north and north-east than in the more southern areas. It is here interesting to note that there is a mean annual difference in temperature of 11 degrees between the extreme north and south of the Island, the northern portion being subject to a severe winter and under the influence of a strong north-east monsoon.

From tests made elsewhere with camphor under cultivation it is apparent that conditions ideal for growth—high rainfall, rich alluvial soil, sheltered position, etc.—frequently result in a low camphor yield compared with similar trees growing in less ideal and more exposed situations. In the same manner trees wholly or partly shaded have been found to yield less than those exposed to full sunlight. It would seem therefore that conditions of climate, rainfall, aspect and soil are all liable to influence the behaviour of *Cinnamomum Camphora* to a greater or less extent,

though it may also be that, in some cases, the genetical make up of the tree is such that its behaviour is not easily influenced by outside factors. In this case the various forms of the camphor tree already discussed might be regarded as distinct physiological strains. That these strains breed true within limits is suggested by the fact that the different forms are to be found growing side by side in Formosa, the forms having become in some way intermixed. On the other hand, that the strains are far from stable is indicated by what resulted from planting the seed of Japanese camphor-yielding trees in South Formosa, where, as already stated, some trees yielded camphor and some only oil. Here it would seem as though the young trees with a fairly stable constitution were the ones that continued to yield camphor, while those less stable had their hereditary tendencies overcome by the influence of climate and environment and yielded oil only in place of solid camphor.

The occurrence of two different oils, or an oil and solid camphor, on different sides of the trunk of the same tree cannot be readily explained, but is suggestive of hybridization between two of the more distinct forms having taken place. Another suggestion presenting itself is, that should such trees be growing in positions whereby a greater degree of exposure to the weather on the one side of the trunk than on the other be experienced, this irregularity of exposure may be the cause. Such disturbing factors, however, as continued and increased sunshine, or driving winds and the consequent lowering of temperature, are not unlikely to be responsible for physiological and chemical changes taking place in the tissues affected by these factors.

In Mauritius, where the camphor tree occurs abundantly, though introduced, it was found some years ago that all attempts at producing solid camphor met with failure. The trees yielded oil only. This was thought at first to be due probably to the effects of local conditions—to climate or elevation—under which the trees first experimented with were grown. Subsequent experiments, however, in which distillations were made from trees in various parts of the island and at various altitudes, still gave negative results. The trees were shown conclusively to be *Cinnamomum Camphora* Nees, and it was concluded that either the climate of Mauritius was generally unsuited to the camphor tree, in so far as yielding solid camphor was concerned, or that the Mauritius trees were all of common descent from ancestors which did not yield solid camphor. That the trees were all of common stock was shown to be extremely likely, the probability being that they were all descended from a consignment of seed introduced by Abbé Gallois from China and planted at the Pamplemousses Gardens and in the Le Reduit Grounds.

It is, however, interesting to record that further distillation tests conducted later on some thirty or more trees growing at Le Reduit and Curepipe disclosed the fact that one tree, "Curepipe

No. 6,'' yielded solid camphor in quantity, all the others yielding oil only as before. It was found that the crushed leaves of this tree bore a strong camphor-like smell, quite distinct from that of all the other trees examined.

Seed from this solitary camphor-yielding tree (Curepipe No. 6) was carefully collected and sown. From it some sixteen young trees, four to five years old, are now established in the Pamplemousses Gardens. Distillations have been made from a number of these trees, and it has been found that all without exception yield a greater or less quantity of solid camphor. It is interesting here to note that Pamplemousses is at an altitude of about 200 feet above sea level as against 1800 feet for Curepipe, with average temperatures two to three degrees warmer and rainfall about half that of Curepipe.

The variable behaviour of the camphor tree appears therefore to be controlled partly by climatic and environmental factors and partly by heredity, and until further information and the results of more detailed experiment and investigation become available the question must perforce remain an open one.

Thanks are due to Mr. W. R. Price, who has travelled extensively in Formosa, for information regarding ''Shiu'' trees, and to Dr. Tempany, Director of Agriculture, Mauritius, for details concerning investigations on camphor and on oil-yielding trees on that island.

XXIII.—CONTRIBUTIONS TO THE FLORA OF SIAM.*

ADDITAMENTUM XXI. E. T. Geddes.

Argostemma albovenatum *Geddes* [Rubiaceae-Hedyotideae]; ab *A. courtallense* Arn., foliis maioribus albo-venosis, pedicellis brevioribus differt.

Herba erecta, 7–14 cm. alta. *Folia* 4, verticillata, duo magna, petiolata, inter se inaequalia, duo parva, sessilia, maiora ovata, apice obtusa, basi lata, 2·5–9 cm. longa, 2·5 cm. lata, supra sicco viridia, glabra, venis costaque alba, subtus sicco pallida, minute et sparse hirsuta, margine ciliata, nervis lateralibus utrinque 7–8, petiolis 2 mm. longis suffulta, minora lanceolata, 1–1·7 cm. longa, 0·5–0·8 cm. lata, supra minute, subtus albo-hirsuta, nervis lateralibus utrinque 4. *Inflorescentia* terminalis, pedunculo 1·5–4 cm. longo glabro suffulta, pedicellis 2–4 mm. longis hirsutis bracteolatis; bracteolae 4, verticillatae, ovatae, 5 mm. longae; flores pauci, umbellati. *Calyx* extra hirsutus, intra glaber, campanulatus; lobi 4, 2 mm. longi; tubus 1 mm. longus, 1·5 mm. diametro. *Corolla* alba (ex *Kerr*); lobi 4, valvati, glabri, 1 mm. longi, 1·5 mm. lati; tubus 1·5 mm. longus. *Stamina* 4, inter se libera, ad basem corollae tubi affixa; antherae obtusae, exsertae, 1 mm. longae; filamenta 0·75–1 mm. longa. *Stylus* brevis, fili-

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* Continued from *K.B.* 1927, p. 72.

formis, 1 mm. longus; stigma bifidum, lobis divaricatis 1·25 mm. longis. *Ovarium* 1 mm. diametro, glabrum.

Pattani, Bukit, 200 m., damp rock by stream, *Kerr* 7117.

Argostemma Craibianum *Geddes* [Rubiaceae-Hedyotideae]; ab *A. plumbeo* Craib, corollae tubo breviore differt.

Herba erecta, circa 6 cm. alta; caulis pallido-hirsutus, foliis duobus squamiformibus linearibus sessilibus 1·5 mm. longis instructus. *Folia* 4, verticillata, duo magna breviter petiolata, duo brevia sessilia, maiora inter se inaequalia, rotundato-ovata, apice brevissime acuta vel rotundata, basi lata et truncata, 4–8·5 cm. longa, 2·5–6 cm. lata, supra sicco fusca, valde hirsuta, marginibus etiam hirsuta, subtus sicco pallida, in nervis venisque hirsuta, nervis lateralibus utrinque circa 7, conspicuis, petiolis alatis hirsutis 2 mm. longis; folio minora ovata vel lanceolata, acuta, pagina utraque hirsuta, 0·5–1·5 cm. longa, 0·2–0·8 cm. lata, nervis lateralibus utrinque 3 4. *Inflorescentia* terminalis, pedunculo glabro 1·2–2·5 cm. longo suffulta; flores umbellati, 4-multi, 4–5 mm. longi, pedicellis 4 6 mm. longis bracteolatis suffulti; bracteolae 4, verticillatae, ovatae, glabrae, 3–4 mm. longae, sessiles. *Calyx* parvus; lobi 4, lati, venosi, margine minute dentati, 2·5 mm. longi, 2 mm. lati, extra puberuli, intra glabri; tubus 0·5 mm. longus. *Corolla* alba (ex *Kerr*); lobi 4, glabri, venosi, ovati, acuti, apicibus iuventute saepe reflexis, extra inconspicue hirsuti, 3 mm. longi; tubus 0·5–0·75 mm. longus. *Stamina* 4, libera; antherae 2 mm. longae, 0·5 mm. latae, apice obtusae, lineares; filamenta basi latiora, 1·5 mm. longa, 1 mm. supra basem corollae tubi inserta. *Stylus* basi latus, 2·5 mm. longus; stigma parvum, capitatum. *Ovarium* circa 1 mm. diametro, puberulum.

Pattani, Banang Sta, 100 m., on rocks by stream in evergreen forest, *Kerr* 7392.

Argostemma ebracteolatum *Geddes* [Rubiaceae-Hedyotideae]; ab affini *A. plumbeo* Craib, foliis angustioribus, floribus pentameris differt.

Herba erecta, 6–14 cm. alta, foliis pedunculis pedicellis calycibusque hirsutis. *Folia* 4, verticillata, ovata vel ovato-lanceolata, apice acuta, basi cuneata, 1·7–7 cm. longa, 0·5–2·5 cm. lata, sicco supra viridia, subtus pallide fusca, nervis lateralibus utrinque circa 4 pagina inferiore conspicuis, membranacea; petioli hirsuti, 2–5 mm. longi; stipulae ovatae, hirsutae, integrae, 2 mm. longae. *Inflorescentia* terminalis, pedunculo hirsuto 0·7–2·5 cm. longo simplice vel dichotome cymoso suffulta; flores 3 vel numerosi, 4 mm. longi, ebracteolati, pedicellis hirsutis 1–4 mm. longis suffulti. *Calyx* extra hirsutus; lobi 5, lanceolati, 2 mm. longi; tubus 0·5 mm. longus. *Corolla* alba (ex *Kerr*), fere campanulata, lobis 5 triangularibus latis atque acutis 1 mm. longis marginibus hirsutis, tubo 2·5 mm. longo. *Stamina* 5, inter se libera, exserta, ad basem corollae tubi affixa; antherae oblongae, basi obtusae,

apice acutae sed vix apiculatae, 1·75 mm. longae, 0·5 mm. latae; filamenta sicco nigra, 1·5 mm. longa. *Stylus* filiformis, 2·5 mm. longus; stigma parvum capitellatum; ovarium 0·75 mm. diametro, hirsutum, ovulis numerosis.

Chiengmai, Mê Chêm, 500 m., rocks by stream in evergreen forest, *Kerr* 6276 A.

Argostemma fragile *Geddes* [Rubiaceae-Hedyotideae]; ab *A. stellato* Craib, foliis ellipticis, pedunculis et pedicellis brevioribus, corollae lobis brevioribus, antheris in columnam brevioiem conniventibus differt.

Herba fragilis, 11 cm. alta, radice brevi; caulis foliis duobus squamiformibus instructus. *Folia* 4, inter se inaequalia, verticillata, ovato-lanceolata vel lanceolata, apice acuminata, basi cuneata, 3·5–5 cm. longa, 1–1·3 cm. lata, membranacea, supra sicco viridia, prope marginem hirsuta, subtus sicco pallida, glabra, nervis lateralibus utrinque 9, sessilia; stipulae 4, verticillatae, 2·5 mm. longae, interdum deciduae. *Inflorescentia* terminalis, pedunculis solitariis vel tribus 1·5 cm. longis; flores tres, 4·5 mm. longi; pedicelli 6–12 mm. longi; bracteolae lineares, 2·5 mm. longae. *Calyx* glaber; lobi 5, triangulares, 1 mm. longi; tubus 0·5 mm. longus. *Corolla* glabra, alba (ex *Kerr*); lobi 5, valvati, acuti, 5 mm. longi; tubus 0·5 mm. longus. *Stamina* 5; antherae in columnam corolla paulo breviorem conniventes, 3 mm. altae; filamenta 1 mm. longa, basi corollae tubi affixa. *Ovarium* 0·5 mm. diametro, glabrum; stylus filiformis, 3·5 mm. longus stigmate capitellato.

Mê Hawng Sawn, Doi Pêpo, 900–1000 m., on trunks of trees in evergreen forest, *Kerr* 6179.

Argostemma laxum *Geddes* [Rubiaceae-Hedyotideae]; ab *A. verticillato* Wall., caule ramoso, pedunculis longioribus, floribus maioribus differt.

Herba erecta, 7–15 cm. alta, gracilis; caules solitarii vel pauci, sicco nigri, glabri, tenues, foliis duobus squamiformibus linearibus ciliatis medium versus instructi. *Folia* 4–6, verticillata, ad caulis apicem evoluta, ovato-lanceolata vel lanceolata, apice acuta vel acuminata, basi cuneata et inaequalia, 1·5 cm. longa, 0·6–1·5 cm. lata, crasse membranacea, supra sicco fusco-viridia, pilis crassis brevibus ad costam et prope marginem instructa, subtus sicco pallide fusca, glabra, nervis lateralibus utrinque 5–10 vix conspicuis prope marginem arcuatis, aut sessilia aut petiolata; stipulae duae, ovato-rotundatae, 2–3 mm. longae, integrae, sessiles. *Inflorescentia* terminalis, umbellato-paniculata, laxa, pedunculo crasso glabro 2–4·5 cm. longo suffulta; bracteolae sessiles, lineares, 2 mm. longae; flores solitarii vel ad quatuor, 1 cm. longi, pedicellis glabris 0·6–1·8 cm. longis suffulti. *Calycis* glabri lobi 5, triangulares, 0·75 mm. longi, tubus 0·75 mm. longus. *Corollae* albae medio rubicundae (ex *Kerr*) lobi glabri, lineares, apiculati, 5–7·5 mm. longi, venosi, margine revoluti, tubus 1·5 mm. longus.

Stamina 5, inter se libera, exserta; antherae magnae, fere lineares, basi obtusae, 5·5 mm. longae, 0·5 mm. latae; filamenta valida, 2 mm. longa. *Ovarium* 1 mm. diametro, glabrum; stylus filiformis, staminibus subaequialtus, 7 mm. longus; stigma parvum, capitellatum.

Doi Angka, 1500–1800 m., on mossy tree trunks, *Kerr* 6334.

Argostemma parvum *Geddes* [Rubiaceae-Hedyotideae]; ab *A. verticillato* Wall., foliis 6-verticillatis differt.

Herba erecta, 5–10 cm. alta, fragilis, glabra. *Folia* 6, verticillata, lanceolata, apice obtusa, basi longe cuneata, 1–3·5 cm. longa, 0·3–0·7 cm. lata, supra sicco luteo-viridia, glabra, subtus ad marginem et ad costam hirsuta, nervis lateralibus obscuris, petiolis brevissimis. *Inflorescentia* terminalis, pedunculo 2–3·2 cm. longo medio bracteato suffulta; flores 2–3, pedicellis tenuibus 8–13 mm. longis basi bracteolatis suffulti. *Calyx* hirsutus; lobi 5, 0·25–4 mm. longi; tubus 1 mm. longus. *Ovarium* 1·5 mm. diametro, glabrum.

Kaw Chang, Salak Pet, 10 m., rocks by stream in evergreen forest, *Kerr* 9230.

Argostemma pubescens *Geddes* [Rubiaceae-Hedyotideae]; ab *A. picto* Wall., foliis angustioribus et minoribus, nervis paucioribus, calyce minore differt.

Herba erecta, parva atque tenuis, 5–11 cm. alta, inferne nuda. *Folia* 6, duobus inferioribus oppositis minoribus petiolatis, aliis verticillatis petiolatis vel sessilibus lanceolatis vel ovato-lanceolatis apice acutis basi cuneatis inaequilateralibus 1–3·7 cm. longis 0·6–1·8 cm. latis supra sicco fusco-viridibus hirsutis subtus pallide fuscis nervis costaque dense hirsutis, nervis lateralibus utrinque 7–10 prope marginem arcuatis, petiolis glabris, lamina decurrente. *Inflorescentia* terminalis, pedunculo hirsuto 2·5 mm. longo suffulta; flores 2–12, 4–5 mm. longi, bracteolati, pedicellis hirsutis 3–6 mm. longis suffulti. *Calyx* extra hirsutus, intra glaber; lobi 5, triangulares, 1·5 mm. longi; tubus 0·75 mm. longus. *Corolla* alba (ex *Kerr*), extra hirsuta; lobi 5, acuti, 1·5 mm. longi, basi 2 mm. lati; tubus 2 mm. longus. *Stamina* 5, inter se libera, exserta, ad basem corollae tubi affixa; antherae basi rotundatae, apice apiculatae, 2·25 mm. longae; filamenta 1·25 mm. longa. *Ovarium* 1 mm. diametro pubescens; stylus filiformis, 2·5 mm. longus; stigma minutim apice bifidum.

Chiengmai, Doi Sutep, damp rocks by stream, *Kerr* 3298.

Argostemma pulchellum *Geddes* [Rubiaceae-Hedyotideae) ; ab *A. stellato* Craib, foliis hirsutis, floribus numerosis, corollae lobis brevioribus differt.

Herba erecta, 4–8 cm. alta. *Folia* 4, verticillata, rotundato-ovata, apice minime acuta vel obtusa, basi lata vel cuneata, 1–2·75 cm. longa, 0·4–2 cm. lata, supra sicco fusco-viridia, hirsuta, subtus pallide fusca, haud forte hirsuta, nervis lateralibus utrinque

circa 5, pagina utraque conspicuis. *Inflorescentia* terminalis; flores 1–4, pedicellis bracteolatis hirsutis 6–8 mm. longis suffulti. *Calyx* extra hirsutus; lobi 5, late ovati, 4 mm. longi, 0·5 mm. lati; tubus 0·5 mm. longus. *Corolla* alba (ex *Rabil*); lobi 5, lanceolati, venosi, acuti, 4 mm. longi, 1·5–2 mm. lati; tubus 1 mm. longus. *Stamina* 5; antherae in columnam conniventes, 3·5–4 mm. longae; filamenta brevissima. *Stylus* tenuis; stigma columnam staminorum paulo superans, capitatum. *Ovarium* 1 mm. diametro, puberulum.

Kaw Chang, Salak Kawk, rocks above sea level, *Rabil* 35.

Argostemma repens *Geddes* [Rubiaceae-Hedyotideae]; ab *A. picto* Wall., foliis hirsutis, caule multo longiore, pedunculo glabro longiore differt.

Herba erecta, 11–25 cm. alta, radice repente 9 cm. longa; caulis glaber nisi prope apicem ubi hirsutus. *Folia* 4, verticillata, inter se fere aequalia, elliptica vel obovata, apice brevissime acuta vel apiculata, basi inaequalia, cuneata, 1·8–5·5 cm. longa, 0·9–3·5 cm. lata, supra sicco fusco-viridia, longis pilis instructa, subtus alboviridia, ad nervos costamque hirsuta, margine hirsuta, nervis lateralibus utrinque circiter 9; folia duo petiolata, duo sessilia, petiolis hirsutis 2–4 mm. longis. *Inflorescentia* terminalis, pedunculo hirsuto 1·7–2·3 cm. longo suffulta; flores numerosi, bracteolati, 5 mm. longi, pedicellis 1–4 mm. longis suffulti; bracteolae 2 mm. longae. *Calyx* hirsutus; lobi 5, triangulares, glabri, venosi, 1 mm. longi, 0·75 mm. lati; tubus 0·5–0·75 mm. longus. *Corolla* alba (ex *Kerr*); lobi extra hirsuti, intra glabri, venosi, ovati, 1·5–2 mm. longi; tubus 2·5 mm. longus. *Stamina* 5, inter se libera, exserta, ad basem corollae tubi affixa; antherae basi rotundatae, apice cuneatae vel acutae, 2 mm. longae; filamenta sicco nigra, valida, 1–1·25 mm. longa. *Ovarium* 1 mm. diametro, puberulum; stylus filiformis, circa 3 mm. longus; stigma parvum, capitellatum.

Nakawn Sawan, Kao Pado, 800–900 m., rocks in evergreen forest, *Kerr* 6068.

Argostemma rotundifolium *Geddes* [Rubiaceae-Hedyotideae]; ab affini *A. picto* Wall., foliis maioribus subrotundatis differt.

Herba erecta, 15–25 cm. alta. *Folia* 4, verticillata, duo magna, duo parva, maiora inter se aequalia, rotundata, apice rotundata vel obtusa, basi lata vel vix cordata, 4·5–9 cm. longa, 5–9 cm. lata, supra sicco viridia, sparse hirsuta, nitentia, subtus sicco pallide viridia, fere glabra, dentibus parvis, petiolis latis alatis 2 mm. longis suffulta, nervis lateralibus utrinque 4–6 conspicuis albis, minora sessilia, lanceolato-ovata vel ovata, acuta, 1 cm. longa, 0·6–1 cm. lata, vix hirsuta. *Inflorescentia* terminalis, umbellata, pedunculo ebracteato glabro 3·5–6 cm. longo suffulta; flores 8–18, 6 mm. longi, pedicellis glabris bracteolatis 7–14 mm. longis suffulti; bracteolae 6, verticillatae, marginibus denticulatae, connatae, lanceolatae, 5–6 mm. longae, 2 mm. latae. *Calyx* denticulatus;

lobi 5, triangulares, extra hirsuti, intra glabri, 1 mm. longi, 0·75 mm. lati; tubus brevissimus, circa 0·25 mm. longus. *Corolla* alba (ex *Kerr*), extra hirsuta, intra glabra; lobi 5, valvati, lanceolati, 4 mm. longi; tubus 0·25 mm. longus. *Stamina* 4; antherae in columnam conniventes, mucronatae, 2·75 mm. longae; filamenta 1·25 mm. longa. *Stylus* filiformis, 4·5–5 mm. longus; stigma exsertum, capitatum, 0·25 mm. diametro; ovarium 1 mm. diametro, puberulum.

Pattani, Betong, 700 m., evergreen forest, *Kerr* 7470.

Argostemma setosum *Geddes* [Rubiaceae-Hedyotideae]; ab *A. Curtisii* King, caule breviore, foliis lanceolatis brevioribus margine setoso-ciliatis differt.

Caulis 5–16 cm. longus, simplex, parte dimidia inferiore defoliatus. *Folia* opposita, inter se valde inaequalia, altero 2·5–3 cm. longo altero circa 0·8 cm. longo, lanceolata, apice acuta, basi cuneata, membranacea, supra sicco luteo-viridia, margine setoso-ciliata et ad costam setis 1 mm. longis instructa, subtus glabra, nervis lateralibus utrinque 8–9 nec conspicuis nec ad marginem pervenientibus; petioli 3 mm. longi, glabri; stipulae triangulares, acutae, 5 mm. longae, sessiles. *Inflorescentia* terminalis, pedunculis glabris 12 mm. longis; flores 2–5; alabastra 7 mm. longa, 3 mm. lata, pedicellis 7 mm. longis glabris medio-bracteolatis; bracteolae 2–3 mm. longae; bracteae 5 mm. longae. *Calyx* campanulatus; lobi 5, 2·5 mm. longi, acuti, glabri; tubus circa 0·5 mm. longus. *Corolla* alba (ex *Dr. Smith*); lobi 5, valvati, acuti, 7 mm. longi; tubus 1·5 mm. diametro. *Stamina* 5; antherae in columnam conniventes, acutae, 7·5 mm. longae, 1 mm. latae; filamenta corollae tubi basi affixa, 1·5 mm. longa. *Ovarium* 1 mm. diametro, glabrum; stylus tenuis, 6–7 mm. longus; stigma lineare, 0·5–1 mm. longum, columnam staminorum paulo superans.

Rawnpibun Hill, 830 m., on stone, *Dr. Eryl Smith* 449 (type): Kao Ram, 400 m., on stone in stream, *Dr. Eryl Smith* 561.

Argostemma umbellatum *Geddes* [Rubiaceae-Hedyotideae]; ab *A. plumbeo* Craib, foliis ovatis, floribus magis numerosis, caule longiore differt.

Herba erecta, 10–14 cm. alta. *Folia* 4, verticillata, membranacea, 2 maiora ovato-rotundata, apice acuta vel rotundata, basi lata, 2·5–7 cm. longa, 0·5–3 cm. lata, paulo inaequalia, supra viridi-olivacea et sparse hirsuta, subtus pallide viridia, dense atque pallide hirsuta in costa nervisque, nervis lateralibus utrinque 5–7, petiolis latis et hirsutis 2–2·5 mm. longis suffulta, 2 breviora sessilia vel subsessilia, aequalia, lanceolato-ovata, 1·5–2·5 cm. longa, 0·6–1·2 cm. lata, nervis lateralibus utrinque 4–5. *Inflorescentia* terminalis, pedunculo glabro 2–3 cm. longo suffulta, 3-multiflora, umbellata, 3·5 mm. longa, pedicellis hirsutis bracteolatis 2·5–5 mm. longis. *Calyx* hirsutus, lobis 4 rotundato-ovatis ad marginem hirsutis venatis 1·5 mm. longis, tubo 0·5 mm. longo. *Corolla* alba (ex *Winit*); lobi 4, breves, unicostati, acuti, glabri,

1–1·5 mm. longi; tubus 2–2·5 mm. longus. *Stamina* 4, libera; antherae lineares, apice rotundatae, 1·25 mm. longae, 0·5 mm. latae; filamenta 1·25 mm. longa, 0·25 mm. supra corollae tubi basem affixa, antheris 0·25 mm. exsertis. *Ovarium* 1 mm. longum et latum; stylus filiformis, 1·75 mm. longus; stigma parvum, capitellatum.

Lampang, 400 m., shady places near stream, *Winit* 746.

Mussaenda cuspidata *Geddes* [Rubiaceae-Mussaendeae]; a *M. Hossei* Craib, foliis elliptico-lanceolatis, petiolis brevioribus, calycis lobo aucto angustiore, corollae tubo breviore differt.

Frutex erectus vel scandens (ex *Winit*); ramuli iuventute ferrugineo-hirsuti. *Folia* elliptico-lanceolata, apice longe acuminata, basi obtusa, 4–9 cm. longa, 2–3 cm. lata, supra hirsuta, fusca, subtus tomentosa, pallida, nervis lateralibus utrinque circa 7 supra conspicuis subtus prominentibus, chartacea vel subcoriacea; petioli breves, 0–3 mm. longi, fusco-hirsuti; stipulae bifidae, acutae, circa 9 mm. longae, hirsutae. *Inflorescentia* terminalis, cymosa, pedunculis dense hirsutis. *Calyx* dense hirsutus; lobi 5, lineares, 1·5–2 mm. longi, hirsuti, lobo aucto 3 cm. longo 2·3 cm. lato pubescente petiolo hirsuto. *Corolla* aurantea (ex *Winit*); tubus 2·1 cm. longus, extra hirsutus, intra pilis luteis ad situm antherarum tectus; lobi 5, oblongi, cuspidati, 2·5 mm. longi, 2 mm. lati, extra hirsuti. *Stamina* 5, in parte corollae tubi dilata posita; antherae lineares, vix 4 mm. longae; filamenta brevissima; prope antherarum bases affixa. *Stylus* fere filiformis, basi quam apice latior, 6·25 mm. longus, glaber; stigmata duo, linearia, 2·5 mm. longa, glabra. *Baccus* 10–12 mm. longus, 6–6·5 mm. latus, calyce persistente, epicarpio lenticellato.

Chiengmai, Mê Kang, 950 m., old clearing in evergreen forest, *Winit* 1310.

Mussaenda ferrea *Geddes* [Rubiaceae-Mussaendeae]; a *M. Hossei* Craib, foliis ellipticis, corollae lobis paulo longioribus, corollae tubo paulo breviore differt.

Frutex in arbis scandens (ex *Kerr*); ramuli iuveniles molliter et dense hirsuti, mox pubescentes lenticellatique. *Folia* elliptica, apice acuminata, basi rotundata vel cuneata, 6·7–10 cm. longa, 3–3·8 cm. lata, supra sicco viridia, dense hirsuta, subtus sicco pallide viridia, pilis tomentosis albis instructa, nervis lateralibus utrinque circa 8 pagina utraque conspicuis; petioli 5–10 mm. longi, fusco-hirsuti; stipulae bifidae, 4–5 mm. longae, dense fusco-hirsutae. *Inflorescentia* terminalis; cymus e floribus compactis compositus. *Calyx* sericeo-hirsutus; lobi 5, inter se inaequales, 1–2 mm. longi, 0·75 mm. lati, lobo aucto fere orbiculari 3·5 mm. diametro. *Corolla* aurantea (ex *Kerr*); tubus 2 cm. longus, extra sericeo-hirsutus, intra in parte tubi dilata pilis luteis tectus; lobi 5, fere orbiculares, cuspidati, 3·5 mm. longi, 2·7–3 mm. lati, extra sericeo-hirsuti. *Stamina* 5, tubo corollae

parte dilata affixa, inclusa; antherae lineares, acuminatae, basi bifidae, 4 mm. longae. *Stigma* bilobum, 2·5–3 mm. longum; stylus filiformis, 5 mm. longus.

Korat, Kao Lêm, 700 m., climbing on trees at edge of evergreen forest, *Kerr* 9974.

Mussaenda longisepala *Geddes* [Rubiaceae-Mussaendeae]; ab affini *M. Teysmanniana* Miq., floribus minime hirsutis, calycis lobis brevioribus differt.

Frutex scandens (ex *Kerr*); ramuli iuveniles hirsuti, mox ferrugineo-hirsuti. *Folia* ovato-lanceolata vel ovata, apice acuminata basi cuneata, lamina decurrente, 6–12 cm. longa, 2·2–5·9 cm. lata, supra sicco fusco-viridia, sparse hirsuta, subtus sicco pallida, pilis longis densis praesertim in costa et nervis tecta, nervis lateralibus utrinque 9–11 pagina utraque prominentibus, nervis transversis conspicuis inter se parallelis; petioli 5–17 mm. longi, pubescentes, pilos longos in axillis ferentes; stipulae bilobae, 7–9 mm. longae, pubescentes. *Inflorescentia* terminalis, pedunculis partialibus divaricatis hirsutis; pedicelli 2–5 mm. longi, pubescentes; bracteae lanceolatae, prope flores 6–8 mm. longae, prope basem cymi breviores. *Calyx* hirsutus; lobi 5, anguste lanceolati, 6–7 mm. longi, lobo aucto albo (ex *Kerr*); rotundato-ovata apice acuminato basi truncato 6·5–11 cm. longo 5–9 cm. lato nervis pubescentes. *Corolla* aurantea (ex *Kerr*); tubus 2·5 cm. longus, extra hirsutus, intra ore pilis luteis barbatus; lobi 5, valvati, orbiculares, cuspidati, 4 mm. longi. *Stamina* 5, in parte corollae tubi dilata posita, inclusa; antherae lineares, apiculatae, basi bifidae, 4·5–5 mm. longae; filamenta 1 mm. longa. *Stigma* bilobum, lineare, 2 mm. longum; stylus vix 2 cm. longus, glaber.

Pattani, Bukit, under 50 m., climbing in scrub, *Kerr* 7139.

Mussaenda mollis *Geddes* [Rubiaceae-Mussaendeae]; ab affini *M. Wrayi* King, corolla pro rata longiore differt.

Frutex scandens; ramuli primo parum compressi, pallide tomentosi et pilis divergentibus instructi, cito pallide ferruginei, mox subferrugineo-tomentosi et teretes, annotini glabri, brunnei vel cinereo-brunnei, conspicue lenticellati, saepe striati. *Folia* ovata, ovato-lanceolata vel interdum lanceolata, apice longe acute acuminata vel subacuminata, basi acuminata vel rarius late cuneata, 4·5–11·5 cm. longa, 2·3–4·5 cm. lata, chartacea, pagina superiore sericea, inferiore pallidiora, tomentosa praetereaque ad costam nervosque laterales pilis longiusculis tecta, nervis lateralibus utrinque 9–14 supra conspicuis subtus prominulis, nervulis pagina utraque obscuris, margine ciliata; petioli 3–10 mm. longi, indumento ei ramulorum simili tecti; stipulae per annum persistentes, bifidae, 5–6 mm. longae, dense adpresse hirsutae. *Corymbi* terminales, usque ad 6 cm. diametro et 4 cm. longi, pedunculo communi rarissime evoluto, pedunculis partialibus tribus ad 10 mm. longis inter se subaequilongis vel mediano laterialibus conspicue longiore, ultimis brevibus, omnibus indumento ei ramulorum

simili tectis, floribus subsessilibus; bracteae 5–8 mm. longae, dense adpresse hirsutae, inferiores haud rarius foliaceae floribus aurantiacis (ex *Kerr*), calycis segmentis omnibus inter se aequalibus lobo expanso haud evoluto. *Receptaculum* longum, dense adpresse hirsutum, cito longius et sparse hirsutum. *Calyx* extra dense adpresse hirsutus; tubus 1 mm. longus; segmenta 5, 10–11 mm. longa, 2·5–3 mm. lata, lanceolata, basi fere cuneata. *Corollae* tubus 2·25 cm. longus, extra dense adpresse hirsutus, intra villosus, lobi 5, late triangulares, 3 mm. longi, 3–4 mm. lati, extra dense adpresse hirsuti, intra glandulosi, valvati. *Stamina* 5, ad tubum corollae in parte turgida adhaerentia; filamenta 1 mm. longa; antherae inclusae, lineares, apice apiculatae, basi vix bilobae, 5 mm. longae; a situ staminorum ad basem tubi corollae 10·5 mm. distat, summis antheris usque ad summum corollae tubum distat 7 mm. *Styli* glabri, lati, 8·5 mm. longi, stigmatibus duobus linearibus subaequalibus 5–6 mm. longis. *Ovarium* 2-loculare, multis ovulis in locularibus.

Pattani, Banang Sta, 50 m., climbing at edge of evergreen forest, *Kerr* 7285.

Knoxia rosettifolia *Geddes* [Rubiaceae-Knoxieae]; ab affini *K. congesta* Pitard, corollae tubo lobisque brevioribus, nervis numerosis et statim adscendentibus differt.

Herba erecta; caulis 10–29 cm. altus, pilis pallidis prope apicem densioribus tectus, quadrangularis, nitens, glaber. *Folia* 4–6, rosulata, ovata vel ovato-lanceolata, apice acuta vel obtusa, 2·5–6·3 cm. longa, 0·7–3 cm. lata, supra sicco fusco-ferruginea, pilata, subtus pallida, nervis marginibusque pilata, nervis utrinque circiter 6, conspicuis, sessilia. *Inflorescentia* terminalis, capitulata, singularis vel duo, pedunculo ramoso vel singulo; flores parvi, subsessiles. *Calycis* lobi 4, breves, inter se inaequales. *Corolla* purpurea (ex *Kerr*); tubus 1·5 mm. longus, extra glaber, intra dense hirsutus; lobi 4, obtusi, 0·5 mm. longi. *Stamina* 4, tubo corollae prope medium affixa; antherae 0·9 mm. longae, inclusae, lineares, apice subacutae, basi emarginatae; filamenta brevissima. *Ovarium* 2-loculare, ovulo singulo magno in loculo pendente; stylus filiformis, 2·5 mm. longus; stigmata duo, revoluta.

Chiengmai, Mê Rim, 1100 m., open grassy pine forest, *Kerr* 6249.

Ixora fusca *Geddes* [Rubiaceae-Ixoreae]; ab affini *I. nigricante* R. Br., floribus iuventute longioribus tenuibusque, corollae et calycis lobis longioribus differt.

Frutex vel *arbor*, 5–6 m. alta (ex *Mrs. Collins*); ramuli primo nigri vel fusci, deinde pallidiores. *Folia* oblanceolata, apice acuminata, obtusa, basi cuneata, 13·2–16·7 cm. longa, 4·3–5·3 cm. lata, sicco nigricantia vel fusca, omnino glabra, subcoriacea, nervis lateralibus utrinque circa 10 subtus prominentibus supra conspicuis ad marginem anastomosantibus, nervulis passim conspicuis passim inconspicuis, petiolis 6–8 mm. longis glabris; stipulae

triangulares, cuspidatae, basi connatae, 6 mm. longae, basi 2 mm. latae. *Inflorescentia* corymbosa, 6 cm. longa, 8·5 cm. lata, pedunculo puberulo articulato; bracteae lanceolatae, 4–5 mm. longae, prope flores breviores; pedicelli florum lateralium circa 2·5 mm. longi; flores terminales sessiles; bracteolae 2, ad basem receptaculi positae, lanceolatae, puberulae, 2 mm. longae. *Receptaculum* glabrum, 1·5 mm. altum. *Calyx* glaber; tubus 0·5 mm. longus; lobi 4, inter se parum inaequales, lanceolati, 2·75–3·25 mm. longi. *Corolla* alba (ex *Mrs. Collins*); tubus glaber, 1·7–1·8 cm. longus, 1 mm. diametro; lobi 4, valvati, anguste oblongi, acuti, 8–9 mm. longi, circa 2 mm. lati. *Stamina* 4, ad summum corollae tubi affixa; filamenta 1·75 mm. longa; antherae acutae, 6·5 mm. longae. *Stigma* bifidum, 4 mm. longum, stylus filiformis; glaber, 2·2 cm. longus.

Sriracha, 8 m., *Mrs. D. J. Collins* 102 A.

Psychotria sempervirens *Geddes* [Rubiaceae-Psychotrieae]; ab affini *P. symplocifolia* Kurz, nervis magis numerosis differt.

Frutex ad 3 m. altus (ex *Kerr*); inflorescentia excepta glaber; ramuli fusci, magis minusve striati. *Folia* elliptica vel late oblanceolata, apice acuminata, summo acuta vel obtusa, basi cuneata, 11–18 cm. longa, 3·8–7·5 cm. lata, firme chartacea, sicco viridia, nervis lateralibus utrinque circa 11–12 pagina utraque prominentibus, margine recurva, petiolo 0·7–3·3 cm. longo canaliculato suffulta; stipulae connatae, 7–8 mm. longae, ovatae et cuspidatae. *Inflorescentia* terminalis, trichotoma, pedunculo communi circa 4·5 cm. longo bifacialiter puberulo suffulta, ramis lateralibus duobus oppositis circa 6 mm. longis. *Receptaculum* 1·5 mm. altum, glabrum. *Calyx* 0·75 mm. longus, dentibus quinque brevissimis. *Corollae* tubus 1·5 mm. longus, extra glaber, ore dense pilosus; lobi 5, valvati, triangulares, apicibus revertis, marginibus inconspicue puberuli, 2 mm. longi, 1·5 mm. lati. *Stamina* 5, ore corollae tubi inter lobos posita; antherae exsertae, oblongae, glabrae, 0·75 mm. longae; filamenta 0·25 mm. longa. *Stylus* filiformis, 2 mm. longus, glaber, bifidus; ovarium biloculare, uno ovulo per loculum basi adhaerente. *Fructus* 9–10 mm. longus, 5·7 mm. latus, breviter pedicellatus, oblongus, carinatus, glaber, calyce persistente; testa 7 mm. longa, 4·5 mm. lata, carinata.

Chiengmai, Doi Sutep, 1050–1200 m., evergreen forest, *Kerr* 1188 (type), 2221.

Prismatomeris fragrans *Geddes* [Rubiaceae-Morindeae]; ab affini *P. tetrandra* K. Sch., floribus multo maioribus differt.

Arbor circa 3 m. altus (ex *Marcan*). *Folia* elliptica, apice acuminata, basi breviter cuneata, 6·7–11·7 cm. longa, 3·3–5·3 cm. lata, sicco altera viridia, altera fusca, supra glabra, nitentia, subtus pallida, glabra, vix nitentia, nervis lateralibus utrinque 10–11 pagina superiore conspicuis prope marginem anastomosantibus, venis subconspicuis; petioli 8–18 mm. longi, glabri, canaliculati; stipulae connatae, glabrae, mox deciduae. *Inflorescentia* termin-

alis, e floribus 2–3 pedicellis 1–3 cm. longis suffultis nitentibus glabrisque ebracteolatis constituta. *Calycis* lobi 5, breves, fere truncati, tubus 4·5–5 mm. longus. *Corolla* alba et odorans (ex *Marcan*), 3 cm. lata; lobi 5, lineares vel lanceolati, apice obtusi, 17 mm. longi, 3·5–4 mm. lati, glabri, coriacei; tubus omnino glaber, 18·5 mm. longus, circa 3 mm. latus. *Stamina* 5, corollae tubi medio affixa; antherae 5 mm. longae, inclusae, linearioblongae, apice basique rotundatae, ad summum corollae tubi pervenientes, connectivo sicco nigro; filamenta 4 mm. longa, infra medium antherarum affixa. *Ovarium* biloculare; stigmata duo, 3 mm. longa, linearia, obtusa, glabra; stylus 7 mm. longus, glaber.

Sriracha, Ban Dan, 20 m., evergreen forest, *Marcan* 1381 (type), 176.

XXIV.—NEW SPECIES FROM THE ANDES OF ARGENTINA. N. Y. Sandwith.

On his return last summer from a horticultural and botanical expedition in Argentina, Mr. H. F. Comber selected from his collection of herbarium specimens some two hundred plants of special horticultural interest of which he had been able to obtain either seeds or living vegetative material. These have been identified at Kew and it is hoped to publish the full list elsewhere; meanwhile it appears advisable to name and describe fourteen new species which were present in this part of the collection.

As is perhaps generally known, Mr. Comber collected in the Territory of Neuquen, between 37° and 40° S., with centres at such places as Neuquen, Chos Malal and Zapala; Chile was entered at least once, but the bulk of the specimens were found well within the limits of Argentina. This choice of ground was no doubt based upon the conclusions reached by Mr. W. B. Turrill in his paper on botanical exploration in Chile and Argentina.* Mr. Turrill's surmise that this area was likely to provide a large number of good new plants seems to have been amply justified, at any rate from the botanical standpoint, as seven per cent. of the selected specimens have proved to be new species, and the rest of the collection numbering four hundred additional gatherings still remains to be named. The whole is a most valuable addition to the Herbarium; whether the horticultural novelties will prove useful in this country remains to be seen.

While Neuquen itself has probably been frequently visited by botanists, it is clear that the Andine region to the west, towards the frontier of Chile, has hitherto been very little worked. Mr. Comber was particularly successful in the dry rocky neighbourhood of Zapala, at an altitude of about 900–1200 metres, where he gathered a fine new *Chuquiragua*, and a remarkable series of *Verbena*

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* *Kew Bull.* 1920, pp. 57–66.

of a spiny Andine type which evidently comprises many more species than have been yet described. The sets of *Adesmia*, *Nassauvia*, *Mutisia*, *Ourisia*, *Calceolaria* and other genera are also of particular interest, as well as of great beauty, for it is obvious that no pains were spared in drying and preparing the specimens, with results that can rarely have been equalled, considering the conditions under which the work was undertaken. Of the new species here described, apart from the spiny Verbenas with their peculiar heterophylly, the most strikingly novel from every point of view are undoubtedly the *Berberis*, the *Anarthrophyllum* and the *Cassia*, each of these exhibiting features which are quite remarkably different from those of the other species of their respective genera.

It is to be hoped that Mr. Comber has been, or will be, able to continue his explorations southwards as far as Lake Nahuelhuapi. The immediate vicinity of the lake has been visited by botanists travelling from the east or west, but there seem to be no records from the whole line of the Andes of Argentina between there and Zapala.

Berberis Comberi *Sprague et Sandwith* sp. nov. [Berberidaceae]; species egregia foliis ramorum longorum omnibus eu-foliaceis nec spiniformibus, foliis ramulorum abbreviatorum saepissime nullis, inflorescentiis solitariis binis vel ternis unifloris, floribus omnibus pentameris verticillis superpositis.

Frutex satis humilis, 0·3–1·2 m. altus, ope surculorum 3·6 m. diametro attingens. *Rami seniores* crassi, circiter 8 mm. diametro 30 cm. infra apicem, internodiis saepius 1–1·5 cm. longis, teretes, cortice griseo extra fibroso fibris delabentibus; rami annotini patuli vel fere patentes, 8–12 cm. longi, internodiis 0·5–2 cm. longis, e basi usque ad apicem manifeste angustati, medio saepius 3–4 mm. diametro, superne subangulati, subargenteo-nitiduli, fibris pallidis secedentibus longitudinaliter fusco-striati. *Folia* (etiam in ramis senioribus diu persistentia) heteromorpha, valde spinoso-dentata, dimidio vel parte minore superiore deltoidea, alia tridentata rhomboidea parte inferiore deltoidea vel convexo-deltoidea, alia quinquedentata hexagona quadrato-rhomboidea lateribus conspicue arcuato-concavis basi subtruncata vel plus minusve cuneata, omnia spinis 1–2·5 mm. longis brunneo-aurantiacis, subsessilia, petiolis brevissimis incrassatis marginibus liberis stipulis minutis hyalinis breviter subulatis terminatis, supra petiolos conspicue articulata, articulo 2–2·5 mm. lato, petiolulo circiter 1 mm. longo; lamina crassa coriacea, margine cartilagineo, glaberrima, 1·7–3·5 cm. longa, 1–2·5 cm. lata, supra nitidula pallide viridia nervis omnino immersis sed rete venularum satis manifesto, subtus glauca nervo medio crasso lateralibusque elevatis rete venularum fere occulto. *Inflorescentiae* axillares, solitariae binae vel ternae, uniflorae; pedunculus ad 2·5 mm. longus, inferne pluriperulatus perulis plerumque oppositis congestis; perulae 2 infimae connatae 0·7 mm. longae, superiores ovato-oblongae vel ovatae apiculatae, 1·5–2 mm.

longae, praesertim versus apicem ciliolatae; bracteolae in flore altero inspecto 2, irregulariter suborbiculares, 2·5–3 mm. diametro, valde irregulariter obtuse sublobatae, membranaceae, ciliolatae, trinerves nervo quarto accessorio laterali minore; in flore altero inspecto bracteolae 5, sensim in sepala transeuntes. *Sepala* 5, minute ciliolata, exteriora 2 suborbicularia 4·5–6 mm. longa 4–4·5 mm. lata 5–nervia, interiora 3 elliptico-obovata 7·5–10 mm. longa 4·5–6 mm. lata 4–nervia. *Petala* 5, elliptico-obovata, in alabastro 6–7 mm. longa 3·4–4·5 mm. lata, in flore aperto 9–10 mm. longa 6–7 mm. lata, apice subtruncata obtuse denticulata, trinervia nervis lateralibus cito bifurcatis, nectariis tribus; in alabastro nectarium intermedium oblongum, 0·7–1 mm. longum, 0·2–0·4 mm. supra basim nervi medii initians; nectaria lateralia superne bifurcata, 1·8–2 mm. longa; in flore aperto nectaria 3–3·5 mm. longa, 1·2 mm. lata. *Stamina* 5; in alabastro 4·5–5 mm. longa, filamentis 2–2·5 mm. longis medio vix 1 mm. latis, apicem basimque versus ampliatis; in flore aperto 7·5 mm. longa, filamentis 4 mm. longis ad 1 mm. latis, antheris 3–3·5 mm. longis; valvae thecarum 2·5 mm. longae. *Pistillum* in alabastro 4·5 mm. longum, stipite 0·5 mm. longo incluso; ovarium subglobosum circiter 2 mm. diametro; stylus 1·5 mm. longus; stigma peltatum ultra 1 mm. diametro; pistillum in flore aperto 7·5 mm. longum, ovario 4 mm. longo 2·5–3 mm. diametro, stylo 3·5 mm. longo 1·8 mm. diametro, stigmate peltato 1·75 mm. diametro. *Ovula* 8–10.

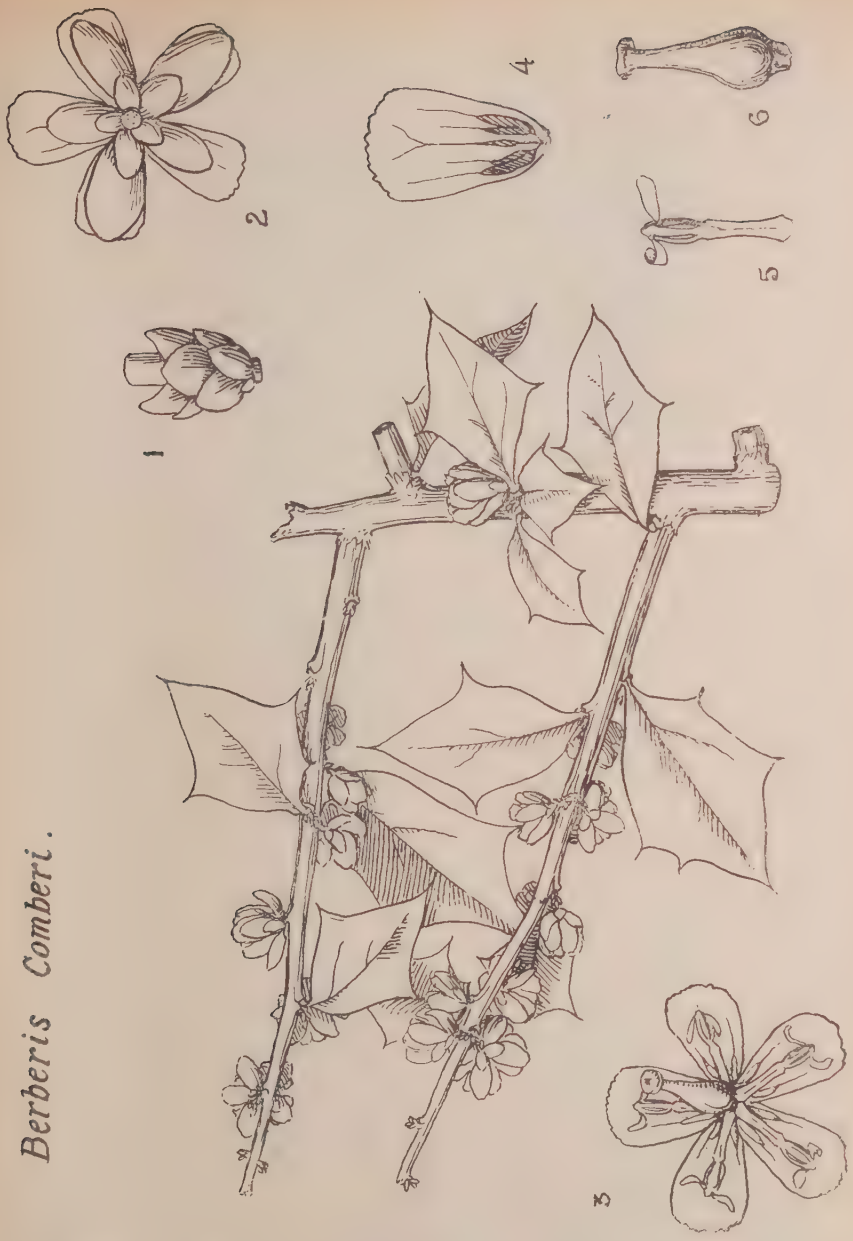
Cerro Lotena, 900 m., September 24th, 1925, *Comber* 49. "Grows in sheltered and exposed places on several kinds of sandy and stony soil, facing south. Free-flowering; flowers orange-yellow, fragrant, with sensitive stamens."

Berberis Comberi is a low shrub, 1–4 ft. in height, occasionally forming masses 12 ft. in diameter by the aid of suckers. The leaves are evergreen and resemble those of holly. It is anomalous in two respects : in the absence of spine-leaves, and in all the flowers being pentamerous with superposed whorls. In a great majority of species of *Berberis* the long shoots bear spine-leaves exclusively, while the foliage-leaves and inflorescences are borne on the short shoots. In *B. Comberi* the foliage-leaves are all but confined to the long shoots, the short shoots being mostly aphyllous.

All parts of the flower exhibit a great increase in size during expansion; hence it seems desirable to give measurements from a flower-bud as well as those from an expanded flower.

Malvastrum corymbosum *Sandwith*, sp. nov. [Malvaceae-Malveae]; affinis *M. Alberti* (Phil.) Reiche, ut videtur, a quo habitu non suffruticoso, foliis magis evidenter quinquelobis, petiolis inferioribus multo longioribus, petalis duplo tantum neque triplo quam calycibus longioribus differt.

Herba annua, pallide viridis, e radice simplici ad 15 cm. longa ramos paucos 10–14 cm. longos, caulem principalem 15 cm. longum emittens; caules inferne vellere pilorum stellatorum brevi denso



Berberis Comberi.

Branch and branchlets, natural size. Fig. 1, peduncle with perulae; 2, exterior of flower from below; 3, interior of flower from above; 4, petal; 5, stamen; 6, pistil:—Fig. 1, × 6; 2 and 3, × 2; 4, 5 and 6, × 3. In Figs. 2 and 3 the parts of the flower are drawn as if pressed out horizontally.

albescente induti, superne viridescentes pilis stellatis majoribus satis numerosis immixtis; internodia 1–2·5 cm. longa. *Folia* inferiora petiolis 2·5–3·5 cm. longis, superiora petiolis 0·7–1·5 cm. longis suffulta; petiolorum indumentum ei caulium partis superioris simile; laminae supra pallide virides, molliter et dense tomentosae, subtus magis cinereae et pilis stellatis multo sparsius indutae, 1–2·5 cm. longae, 0·8–2·5 (vulgo 2) cm. latae, facie ei *M. humilis* A. Gr. simili, triangulari-ovatae, inferiores distincte superiores obscurius quinquelobatae, lobis imbricatis 4 inferioribus 4–8 mm. longis 4–9 mm. latis, lobo medio majore ovato 0·7–1·3 cm. longo atque lato, lobis omnibus satis profunde atque late rotundato-crenatis, crenis 1–4 mm. longis atque latis; stipulae subulatae, ad 6 mm. longae. *Inflorescentia* apice caulium satis dense corymboso-paniculata, ramis inferioribus in axillis foliorum superiorum longe pedunculatis; pedicelli 1–6 mm. longi; bracteae integrae, lineares, 3–5 mm. longae, ut bracteolae pedicelli calycesque dense stellato-tomentosae; bracteolae 3 setaceae, 3–5 mm. longae. *Calyx* 8–9 mm. longus, in lobos anguste ovato-lanceolatos vel triangulari-lanceolatos 5–6·5 mm. longos, 2–3 mm. latos divisus. *Corolla* laete rosea, siccitate purpurea, 1·3 cm. longa, petalis basi stellato-pilosis. *Staminum columna* pilis stellatis sparse induta, 2·5 mm. longa, apice in filamenta 2 mm. longa divisa. *Ovarium* 1·5 mm. diametro, parte superiore et praesertim apice satis longe pilosum; styli rami 11, ad 2 mm. longi, apice clavato-stigmatosi.

Rio Coyunco, in sandy region, November 12th, 1925, *Comber* 140.

Cristaria eburnea *Sandwith*, sp. nov. [Malvaceae-Malveae]; affinis *C. argyliifoliae* Phil., ut videtur, caulibus albo-tomentosis nec hirsutis, foliis ambitu suborbicularibus nec ovatis, etiam inferioribus valde partitis, stipulis longioribus, calyce longiore differt.

Herba teste lectore perennis, prostrata, cinerea, 22·5–60 cm. diametro, apice radicis simplicis ultra 9–12 cm. longae complures ramos axillares 10–18 cm. longos caulem principalem brevem facile superantes emittens; rami plerumque simplices, 2–3 mm. diametro, inferne vellere albo-eburneo brevi denso pilorum stellatorum obtecti, superne ut folia tomento minus denso igitur facie paulo farinosiore magis cinerea praediti, apicem versus in inflorescentias arcuato-adscendentes; internodia 2–4·5 cm. longa, superiora multo breviora. *Folia* infima petiolis 2–4·5 cm. longis suffulta, suborbicularia, 3 cm. longa, 3–3·5 cm. lata, profunde in petiolum pedatim quinque-partita, segmento medio cum petiolulo ad 5 mm. longo, segmentis omnibus profunde bipinnatifidis, laciniis primariis 0·5–1 cm. longis, 3–8 mm. latis, secundariis oblongis obtusis vel rotundatis 1–5 mm. longis, 1–2 mm. latis; folia superiora petiolis 1–2 cm. longis suffulta, infimis similia sed nonnunquam tripartita et saepe minus composita ita ut segmenta solum simpliciter pinnatifida esse videantur; stipulae subulatae 2–3 mm. longae. *Flores* in axillis foliorum superiorum solitarii, inferiores cum pedunculis 2–2·5 cm. longis, ceteri apice ramorum conferti cum pedunculis

gradatim diminuentibus. *Calyx* campanulatus, pilis stellatis quam alibi conspicue longioribus laxioribusque vestitus, 8–10 mm. longus, infra medium in lobos triangulari-lanceolatos 6 mm. longos basi 2·5–3·5 mm. latos divisus. *Corolla* laete rosea, siccitate purpurea, 1·5–2 cm. longa, igitur ad 4 cm. diametro. *Tubus staminеus* glaber, 2·5 mm. longus, apice in filamenta propria 2–3 mm. longa divisus. *Ovarium* glabrum, 2 mm. diametro; stylus 0·5 mm. longus, ramis 14 glabris, 1·8–2 mm. longis, apice clavato-stigmatosis.

Zapala; common in sand around the town, fl. November 11th, 1925, *Comber* 134.

This should be compared with several other Patagonian species of *Cristaria* of which I have not seen specimens. None of the descriptions, however, agrees with the above.

Larrea simulans *Sandwith*, sp. nov. [Zygophyllaceae]; affinis *L. nitidae* Cav., habitu prostrato, ramis magis nodosis atque intricatius dispositis, squama staminali longiore, praesertim foliis multo minoribus tantum 5–7-foliolatis, foliolis minus parallelis, primo visu facile dignoscitur.

Frutex glutinosus, teste lectore prostratus, 2·4 m. diametro; ramuli seniores internodiis 3–10 mm. longis, hornotini pubescentes 1–5 cm. longi internodiis 2–4 mm. longis. *Folia* ovata, pinnata, glabra vel sparse pilosa, 2–6 mm. longa, 2–4 mm. lata, foliolis 5–7 oblongis apicem versus decrescentibus, 1–3·3 mm. longis, 0·5–1·3 mm. latis. *Flores* in axillis solitarii, pedunculis pubescentibus 1–4 mm. longis. *Calyx* sepalis ovatis 3·5–4·5 mm. longis, vulgo 2·5 mm. latis. *Corolla* flava, petalis 7 mm. longis. *Staminum* filamenta 7 mm. longa, squamis 4–4·5 mm. longis; antherae 1·7 mm. longae, apiculatae. *Ovarium* ut in *L. nitida* argenteo-pilosum, 2·3 mm. diametro, stylo 2–3 mm. longo.

Cerro Lotena; in sheltered and exposed places side by side with *L. nitida* and flowering at the same time, October 27th, 1925, *Comber* 105.

Differs conspicuously from *L. nitida* by the small leaves which bear only five to seven leaflets, whereas those of *L. nitida* bear from ten to thirteen. After an examination of several flowers from both species, the staminal scale of *L. simulans* was found to be uniformly longer than that of *L. nitida*. Mr. Comber says that the new plant grows with *L. nitida*, but that there are no intermediates, and that it is prostrate, whereas *L. nitida* grows to a height of from three to ten feet. From this evidence the plant would seem to deserve specific rank. It may lie between *L. nitida* and *L. Ameghinoi* Speg., as the latter is described as a prostrate shrub with only 3–5-lobed pubescent leaves, which are 6–7 mm. long and 4 mm. broad.

Anarthrophyllum ornithopodum *Sandwith*, sp. nov. [Leguminosae–Genisteae]; ab omnibus speciebus adhuc descriptis floribus vulgo 5-6 apice ramulorum capitatis, dentibus calycis apice longe spinoso-setaceis, praecipue foliis saepius 4–5-fidis mire differt.

Frutex "0·9–1·8 m. altus," ramis junioribus flavo-olivaceis 2–3 mm. diametro, partibus novellis cum pilis albis adpressis sericeis vestitis; vetustioribus rubro-cinereis 3–7 mm. diametro; internodia 5–10 mm. longa. *Folia* petiolis 3–6 mm. longis 1·5–3 mm. latis suffulta, 4–5- rarius 3-partita, segmentis stellato-divaricatis rigidis spinosis striatis primo viridi-argenteis tum fusco-olivaceis, 1·3–3·3 (vulgo 2·5) cm. longis, 1–2 mm. diametro; stipulae triangulari-ovatae vel anguste triangulari-lanceolatae, erectae et saepe ramulis subadpressae, juventute ut ramuli calycesque sericeo-argenteae, serius glabrescentes costatae spinosae, saepe ultra medium connatae, 3–5 (vulgo 5) mm. longae, igitur petiolos aequantes vel saepius paulo superantes, basi 2–3 mm. latae. *Flores* 3–6 (vulgo 5–6) apice ramulorum capitatim aggregati, subsessiles vel saepius cum pedicellis 1–3 mm. longis; bracteae 2–3 integrae, lineari-setaceae, 5–8 mm. longae. *Calyx* dense sericeo-argenteus, pilis quam in ceteris partibus longioribus laxioribusque; tubus 5 mm. longus, 3–4·5 mm. latus; labia subaequilonga, 1·2–1·3 cm. longa, dentibus apicem versus glabris et fusco-spinescentibus, eis labii superioris basi 2·5–3 mm. latis, eis labii inferioris usque ad 3·5 mm. supra basim connatis. *Corolla* aurantiaca; vexillum circiter 2 cm. longum, 1 cm. latum, lamina extra sericeo-pilosa basi ut alae et carina auriculata; alae et carina glabrae, 1·75 cm. longae. *Stamina* glabra, 9, in vagina 9–10 mm. longa superne fissa connata, partibus liberis ad 6 mm. longis; stamen decimum vexillare 4–7·5 mm. supra basim vaginae conjunctum, igitur parte libera 1–1·2 cm. longa. *Ovarium* lineare, adpresse sericeo-pilosum, gradatim in stylum glabrum arcuatum stigmate capitellato productum, cum stylo 1·7–2 cm. longum, 2–3 mm. diametro; ovula 5.

In sandy soil between Chos Malal and Rio Agrio, at 900 m., fl. November 23rd, 1925, *Comber* 200.

A very remarkable plant, as indicated in the diagnostic phrase; but there seems at present to be no sufficient reason for removing it from this genus. Hitherto the species of *Anarthrophyllum* have fallen naturally into two sections, one with simple (§ *Amerophyllum*), the other with tripartite (§ *Trimerophyllum*) leaves; none has ever been said to produce quadri- or quinquepartite, as well as tripartite, leaves. Two other species, *A. brevistipula* Phil. and *A. rigidum* (Gill. ex H. & A.) Hieron., bear flowers congested in heads, but the corollas are small, nor have the calyces the long spinescent teeth which are so characteristic of *A. ornithopodum*.

Adesmia guttulifera *Sandwith* sp. nov. [Leguminosae-Hedysareae]; (Series *Spinescentes* Taubert in Engl. & Prantl, Pflanzenfam., iii. 3. 322); forsan affinis *A. genistoidi* Presl, et *A. virenti* Phil., foliis brevioribus arcuato-recurvatis 3-jugis tantum, foliolis crassis plicatis, petiolis pedicellis calycibusque glabris nec pubescentibus sed glandulis multis sessilibus punctatis differt.

Frutex lignosus, spinosus, 0·3–1·5 m. altus, 0·3–1·2 m. diametro; spinae vetustiores cinereae, aliae nudae, aliae nodis spinas novellas

superne floriferas inferne foliatas 2 -6 cm. longas basi perulis brunneis confertis stipularibus circumdatas edentes; partes novellae omnes pallide virides, glandulis olivaceis sessilibus conspicuis numerosis praeditae, aliter omnino glabrae, pagina foliolorum superiore excepta. *Folia* arcuato-recurvata, 8–15 mm. longa, 3-juga, rhachide apice ad 1·5 mm. conspicue producta, petiolis 4–6 mm. longis; foliola elliptica vel obovato-oblonga, 3–7 mm. longa, 1·5–2·5 mm. lata, plerumque plicata vel etiam fere conduplicata, crassa enervia, nervo medio prominente excepto, pagina superiore pilis adpressis inconspicuis sed satis densis vestita, inferiore glabra, utrinque et praesertim in margine quasi sinuato-dentato glandulis sessilibus conspicuis notata; rhachis inter juga inferiora vulgo 3 mm. longa; stipulae novellae basi connatae, fere 2 mm. longae. *Inflorescentia* in spinis novellis glandulosis basi foliatis racemosa, vulgo 3 cm. longa; pedicelli 1–2 cm. longi; bracteae integrae ovatae, 1–2·5 mm. longae, saepe concavae et cymbiformes. *Calyx* campanulatus, cum dentibus 5–6 mm. longus, 3–4 mm. latus, superne in dentes late triangulari-subulatos 1·5–2·5 mm. longos divisus, extra ut pedicelli bracteaeque glaber et glandulosus, intus superne breviter et dense pilosus. *Corolla* lacte flavo-aurantiaca; vexillum glabrum, circiter 1·25 cm. longum, lamina fere 1 cm. lata; alae glabrae, circiter 1·25 cm. longae; carina circiter 1 cm. longa, margine dorsali leviter et inconspicue piloso. *Stamina* glabra, 1–1·4 cm. longa. *Ovarium* 5–6 mm. longum, papillis albis densis obtectum; stylus glaber, fere 1 cm. longus, stigmate capitellato; ovula 5–6. *Fructus* ignotus.

Cerro Lotena, Neuquen and Zapala, in moister and more sheltered spots, fl. October 27th, 1925, *Comber* 102. "Wood very brittle".

Cassia (§ **Senna**) **egregia** *Sandwith* sp. nov. [Leguminosae-Caesalpinioideae]; foliis 1–4-foliolatis, stipulis parvis rubro-purpureis tumentibus glanduliformibus insigniter dignoscitur.

Suffrutex verisimiliter ramosissimus; rami seniores cortice rugoso pallide fusco, 3·5 mm. diametro; partes juniores omnes siccitate pallide virides, pilis albis adpressis inconspicuis nisi in alabastris pedicellisque junioribus subargenteis indutae; rami juniores striati, ad 3 mm. diametro, nodis plerisque ramulos 3–15 cm. longos edentes; internodia 1–2·5 cm. longa, infimis ramulorum 3–4·5 cm. longis exceptis. *Folia* paripinnata, 1–2-juga vel nonnunquam pseudo-trifoliolata foliolo altero jugi superioris necnon internodio rhacheos suppresso, cum petiolo 1–1·8 cm. longa; petiolus 3·5–7 mm. longus, in foliis 1-jugis vel trifoliolatis ultra insertionem foliolorum paullum productus; rhachis foliorum 2-jugorum 1–3 mm. longa, ultra jugum superius ad 1 mm. pariter producta; foliola petiolulata, obovata vel obovato-oblonga, apice rotundata, truncata vel emarginata, saepius ob nervum medium excurrentem obscure apiculata, basi rotundata vel saltem obtusa, nervo medio prominente excepto enervia, crassiuscula, 5–12 mm.

longa, 3–7 mm. lata, glandula cylindrica pallide rubra 0·5 mm. longa inter foliola inferiora supra praedita; stipulae parvae 1·5 mm. longae, sed cum facie curiosa conspicuaque, quod sunt rubro-purpureae, ovoideae, acuminatae, inferne tumentes glanduliformes ad 1 mm. latae, tum subito subulato-acuminatae. *Inflorescentia* foliata, e pedunculis 1–2-floris in axillis foliorum superiorum constituta; folia suffulcientia inferioribus similia sed minora; pedunculi 1–3 cm. longi, graciles; pedicelli 0·8–2 cm. longi floribus sub antherarum pondere saepe nutantibus; bracteae apice pedunculi positae, 1·5–2 mm. longae, cum facie et colore simili ei stipularum sed basi multo minus tumidae. *Sepala* olivacea, membranacea, minute ciliata, rotundato-ovata, inaequalia, majora circiter 9 mm. longa 8 mm. lata, minora 5 mm. longa 3·5 mm. lata. *Corolla* flavo-aurantiaca, circiter 2·7 cm. diametro, petalis cum ungue 1·3–1·5 cm. longis. *Stamina* 3 summa imperfecta filamentis 2 mm. longis, antheris 2 mm. longis atque latis; 7 perfecta antheris apice 2-porosis fere aequalibus 4·5–5 mm. longis 2 mm. latis, filamentis 4 superiorum 3 mm. longis, 3 inferiorum 6–10 mm. longis. *Ovarium* curvatum, stylo excepto dense adpresse pilosum, ad 1·7 cm. longum. *Fructus* abest.

Near Chos Malal, common in many dry places, at 1200 m., November 20th, 1925, *Comber* 163. "Has the habit of *Genista tinctoria*."

Remarkable for its minute red stipules, which have the appearance of swollen glands.

Chuquiraĝua straminea *Sandwith* sp. nov. [Compositae-Mutisieae]; habitu et facie *C. oppositifoliae* Gill., foliis alternis angustioribus, involucri bracteis etiam juventute glabrescentibus nitentibusque, interioribus strictis, exterioribus laxe et insigniter patulis demum reflexis differt.

Frutex spinosus, 90 cm. altus, ramis lignosis intricatis nigro-cinereis 2–10 mm. diametro; ramuli novelli pallide straminei pubescentes, 3–5 cm. longi, 1–1·3 mm. diametro. *Folia* et nodis ramorum vetustiorum fasciculata, et per ramulos novellos alterna internodiis vulgo 4–7 mm. longis; omnia lineari-lanceolata, 0·8–1·5 cm. longa, 1–2 mm. lata, apice spinescentia crassiuscula sed fragilia et caduca, pallide viridia, utrinque pilis adpressis sericeis inconspicue vestita, pagina inferiore nervo medio conspicuo quasi carinata; spinae axillares geminae, stramineae, 0·6–1·5 (vulgo 1·2) cm. longae. *Capitula* apice ramulorum solitaria, mediocria, flavo-aurantiaca, siccitate laete straminea; adulta vulgo 2·3 cm. longa; involucri bracteae glabrescentes nitentesque, apice spinescentes, in compluribus seriebus dispositione triplici satis conspicua dispositae: interiores stricte erectae, glabrae vel intus apicem versus leviter sericeae, lineari-lanceolatae, 1·8–1·9 cm. longae; mediae breviores latioresque, primo patulae demum insigniter reflexae, intus apicem versus sericeae, lanceolatae, 1·5–1·7 cm. longae, ad 3·5 mm. latae; exteriores multo minores, pallidiores,

magis spinescentes, semper erecto-adscendentes vel adpressae, diutius pubescentes, ovato-lanceolatae sed ad 2·5 mm. tantum latae. *Corollae* 1·3–1·4 cm. longae, bracteas involucri interiores aequantes, tubo intus atque extra parce piloso, lobis 4 mm. longis apicem versus breviter sed dense sericeo-pilosis. *Stamina* filamentis 6 mm. longis; antherae circiter 9 mm. longae, basi ad 2–2·5 mm. sagittatae. *Stylus* 1·7 cm. longus, igitur corollam excedens. *Achaenia* sericeo-villosa, 3 mm. longa; pappi setae numerosae, circiter 1 cm. longae.

Zapala, in desert region, at 900 m., March 15th, 1926, *Comber* 585.

A very beautiful plant, differing conspicuously from other species of the genus in the strongly contrasted directions taken by the various series of bracts in the bright straw-coloured heads. Other alternate-leaved species with axillary spines, for instance *C. spinosa* D. Don and *C. argentea* Speg., have a different involucral arrangement with a different indumentum, broader or shorter leaves, and, in the case of *C. argentea*, a very different habit.

Calceolaria (§ **Scapiflorae**) **poikilanthes** *Sandwith* sp. nov. [Scrophulariaceae]; forsan affinis *C. biflorae* Lam., foliis minoribus obovato-spathulatis supra pilis albis longis conspersis, floribus simul ochroleucis purpureisque differt.

Herba perennis, acaulis, scaposa, biflora, radice dense fibrosa. *Folia* satis parva omnia radicalia, in rosulis compluribus confertis disposita, obovato-spathulata, apice rotundata, lamina usque ad basim folii decurrente ita ut petiolus vix distingui possit, majora in toto 1·2–4 cm. longa, 0·8–3 cm. lata, parte petiolari 3–5 mm. lata, integerrima, margine nonnonquam sinuata, pallide viridia, supra et in margine pilis albis longis articulatis insigniter conspersa, subtus glaberrima fortiter nervata. *Scapi* 1–2, graciles, nudi, e foliis rosularum summis minimis surgentes, breviter glanduloso-pilosi, 12–15 cm. alti, tum furcati biflori sed ebracteati, pedicellis magis glandulosis 1–3 cm. longis. *Calyx* dense breviter glandulosus, lobis ovato-lanceolatis 3–4 mm. longis, 2–2·5 mm. latis. *Corolla* teste lectore supra laete ochroleuca subtus purpurea, siccitate saepius maculis anastomosantibus velut in *Fritillaria Meleagris* L. notata, parce et inconspicue glandulosa ; labium superius calyce brevius, 2–3·5 mm. longum, 3–4 mm. latum; labium inferius orbiculare, fere clausum, siccitate circiter 1·6 cm. longum, ad 1·8 cm. latum.

Suangulo; growing in masses in moist and sheltered, but sunny, places at 1800–1950 m., January 16th, 1926, *Comber* 487. "On January 30th, the flower-stems were frozen in the exposed places. Flowers rich cream above, purple beneath."

Argylia robusta *Sandwith* sp. nov. [Bignoniaceae-Tecomeae]; forsan affinis *A. uspallatensi* DC., magnitudine omnium partium praesertim caulis alti fere nudi longeracemosi multiflori, calycis dentibus angustioribus longioribus acutis, statim distinguitur.

Herba perennis, teste lectore 30–60 cm. alta, e radice principali crassa 8–12 mm. diametro emittens ramos breves seu surculos apice foliis coronatos e quibus surgunt 1–4 caules floriferi robusti nudi vel basi parce foliati vel nonnunquam etiam ramosi, 10–40 cm. longi, striati, satis dense breviter glandulosi, 2·5–4 mm. diametro. *Folia* surculorum floriferorum petiolis longis cylindricis glandulosis caulibus similibus basi dilatatis 5–9 cm. longis 2–4 mm. diametro suffulta, 5-partita; foliola obovata vel obovato-lanceolata, basi cuneata, 2–5·5 cm. longa, 1–2·8 cm. lata, versus apicem profunde vel inciso-crenata, crenis ad 6 mm. longis rotundatis saepe ipsis crenatis, vel acute inciso-serrata, plerumque versus basim integra, coriacea, supra glaberrima, subtus ut ceterae partes dense glandulosa, nervo medio subtus prope basim crassissimo nervisque lateralibus conspicuis, foliolo terminali lateralibus semper longiore atque latiore. *Folia* surculorum adhuc sterilium (in planta Fischeriana tantum visa) minora, plerumque tripartita, petiolis brevioribus, foliolis magis rotundato-obovatis et magis rotunde crenatis. *Racemus* adultus ad 19 cm. longus; bracteae subulatae, glandulosae, 3–5 mm. longae; pedicelli glandulosi, 3·5–8 mm. longi. *Calyx* 7–9 mm. longus, in lobos lineari-lanceolatos, acutos, extra dense glandulosos, marginibus dense albo-ciliatis, intus glabros, 4·5–7 mm. longos, 1–1·3 mm. latos divisus. *Corolla* laete flava, tubo ad 3·5 cm. longo, superne ad 1·4 cm. latitudine ampliato, extra et intus dense breviter piloso, limbo 2·5–3 cm. diametro. *Staminum* quattuor didynamorum filamenta superne glabra, prope basim atque sub insertione dense glandulosa, parte libera 2 longiorum circiter 1·8 cm., 2 breviorum 8–9 mm. longa; antherarum loculi divergentes circiter 4 mm. longi; stamen quintum abortivum filamento glabro 5 mm. longo, anthera sterili 2·5 mm. longa. *Ovarium* juvenile disco satis conspicuo 1·75 mm. lato et alto sessile, minute glandulosum, cylindricum, fere 3·5 mm. longum, 1 mm. diametro. *Fructus* (in planta Fischeriana tantum visus) dense breviter glandulosus, maturitate sursum arcuatus, 4·5–5·5 cm. longus.

Between Rio Agrio and Chos Malal, at 900–1200 m., fl. November 20th, 1925, *Comber* 162. "Leaves shiny; flowers rich yellow, not scented. Found in two places on the road in hot dry places."

To this belongs Fischer 172, from General Roca, Rio Negro, distributed as *A. trifoliolata* DC., presumably on account of the tripartite leaves on the young non-flowering shoots. *A. trifoliolata*, which was founded on a misunderstanding, was collected at Uspallata by Cruickshank, and is *A. uspallatensis* DC. *A. robusta* has evidently no affinity whatsoever with *A. potentillaefolia* DC., though its leaves would at once suggest that name.

Verbena (§**Verbenaca, Pungentes**) **cedroides** *Sandwith* sp. nov. [Verbenaceae]; affinis *V. tridenti* Lag., ramulis novellis foliis calycibusque pallentibus glabrescentibus, inflorescentiis brevioribus paucifloris, bracteis plerisque ovatis integris, foliis axillaribus

secundariis paucioribus atque plerumque longioribus laxe rosulatim nec unquam in ordinibus tetraquetris dispositis differt.

Frutex humilis, 22·5–90 cm. altus, ramis cinereis spinosis intricatis, vetustioribus 2–6 mm. diametro cum nodis fasciculisque foliorum quadrifariam dispositis, novellis florigeris oppositifoliis 2–3 cm. longis minute puberulis vel glabrescentibus. *Folia* brevissima, carnosa, subnitentia glabra, heteromorpha. *Folia primaria* fere ad basim trifida, lobis 0·5 mm. latis, lateralibus centrali vix 2 mm. longo brevioribus, in ramis vetustioribus sub fasciculis foliorum novellorum spinescentia et cinerascentia. *Folia secundaria* in ramis vetustioribus laxe rosulatim fasciculata, linearia vel lineari-oblonga, 1·5 3·5 mm. longa, 0·5–1 mm. lata, igitur primaria superantia, cetera in ramulis novellis similia sed pauciora et breviora. *Inflorescentia* apice ramulorum breviter spicato-capitata cum floribus (vulgo 5–8) 1-1·8 cm. longa; bracteae omnes calycibus multo breviores, 1–2 inferiores foliis primariis trifidis simillimae, ceterae integrae ovatae acutae breviter ciliatae, 2 mm. longae, vulgo 1·5 mm. latae. *Calyx* olivaceus, facie glabra atque subnitente sed sub lente saepe minute adpresse puberula; tubus 5-6 mm. longus, 1–2 mm. latus; dentes 1–1·5 mm. longi, basi triangulares tum acute divaricato-subulati. *Corolla* alba vel lavandulaceo-caerulea, suaveolens, cum pubescentia *V. tridentis* et *V. asparagoidis* propria; tubus 9 mm. longus, parte e calyce exserta extra ac intus dense griseo-pubescente; limbus 5 8 mm. diametro, circa faucem dense griseo-pubescens. *Stamina* ut in *V. tridente*. *Ovarium* truncatum, 1·2 mm. longum, 0·7 mm. diametro, glabrum; stylus glaber, cum stigmate 4·5 mm. longus.

Zapala; common on the hottest driest rocks in the district, at 900 m., fl. November 27, 1925, *Comber* 189.

This very attractive species is related to *V. tridens* Lag. (*V. Carroo* Speg.) and *V. asparagoides* Gill. & Hook., and comes fairly near to the former, but is distinguished at once by the characters given in the diagnostic phrase. *V. asparagoides* is a very different plant with much larger, strongly spiny, primary leaves; a many-flowered, closely-packed, hairy inflorescence; and shorter calyces, with longer, conspicuously spiny, teeth. Zapala lies between the areas of these two related species.

Verbena (§ **Verbenaca, Pungentes**) **Comberi** *Sandwith* sp. nov. [Verbenaceae]; habitu et facie *V. erinaceae* Gill. & Hook., indumento dissimili, foliis primariis spinosis brevioribus, secundariis ovatis vel ellipticis potius quam linearibus differt.

Frutex humilis, spinoso-pulvinatus, teste lectore 0·3–1·8 m. diametro; caules primarii lignosi, in typo 6–8 mm. diametro; rami vetustiores multi, elongati, spinosissimi, foliis vetustis obtecti, apice ramulos hornotinos dense foliatos et floriferos argenteo-pilosulos congeste corymbosos breves circiter 2 -3 cm. longos gerentes. *Folia primaria* subulata, valde spinosa, haud vel basi tantum ciliata, supra dense adpresse sericeo-pilosa, subtus glabrescentia crasse

carinata, plerumque recte adscendentia, basi connata, 7–13 (vulgo 10) mm. longa; inferiora in ramulis hornotinis nonnunquam breviora, minus pungentia, apice recurvata. *Folia secundaria* in axillis primariorum rosulata, saepius satis pauca et inconspicua, ovata vel elliptica, carnosa, dense breviter adpresse albo-pilosa, 1–2·5 mm. longa, ad 1 mm. lata. *Flores* apice ramulorum gemini, folia spinosa aequantes vel superantes; bracteae dense adpresse pilosae, ovato-lanceolatae, apice spinescentes glabrae, costa centrali conspicua glabra, basi connatae, 4 mm. longae, 2 mm. latae, igitur calycis tubum subaequantes. *Calyx* dense adpresse pilosus; tubus 4·5 mm. longus; dentes inaequales, paullum spinescentes, ad 1·5 mm. longi. *Corolla* alba vel caerulea; tubus extra glaber, intus pilosus, circiter 1 cm. longus; limbus ad 9 mm. diametro. *Stamina* filamentis brevissimis; superiora corollae tubo infra fauces ita longe affixa ut antherae videri non possint. *Ovarium* glabrum, ad 1 mm. altum; stylus glaber, cum stigmate 6·5 mm. longus.

Rio Coyunco, in sandy soil at 750 m., fl. November 12th, 1925, *Comber* 138. "A hard cushion plant. Flowers white or blue, sweetly scented."

Spegazzini described *V. erinacea* as a very variable species, but this plant cannot possibly be considered conspecific with the type of Gillies and Hooker.

Verbena (§ **Verbenaca, Pungentes**) **dolichothyrsa** *Sandwith* sp. nov. [Verbenaceae]; forsan affinis *V. hystrici* Briq., foliis primariis omnibus integerrimis plerumque longioribus, secundariis multo majoribus, bracteis calycibusque longioribus differt.

Frutex humilis, teste lectore 15–45 cm. altus, 22–65 cm. diametro; rami vetusti cinerei, 5 mm. diametro, apice caules juniores annotinos multos aggregatos saepius 8–10 cm. longos 2 mm. diametro edentes; caules annotini partibus novellis terminati, ex axillis foliorum vetustiorum spinescentium ramulos hornotinos brevissimos floriferos 0·8–1·5 cm. longos emittentes. *Folia primaria* vetustiora valde spinescentia, 8–10 mm. longa, integerrima, albo-cinerea, juvenilia apice ramorum connata, 3–6 mm. longa, pubescentia. *Folia secundaria* brevissima, in axillis foliorum spinescentium vel laxe rosulatim fasciculata vel basi ramulorum floriferorum disposita, linearia vel lineari-oblonga, 2–3 mm. longa, obtusa vel saepe apiculata, carnosa, pubescentia, subtus valde carinata. *Inflorescentiae* ramulos brevissimos supra commemoratos ita terminantes ut thyrsum longum angustum foliatum praebeant; bracteae ovatae, integrae, connatae, pubescentes atque ciliatae cum nervo medio crasso, 2–3 mm. longae, 1·5–2 mm. latae. *Flores* 2–6 ramulos singulos terminantes. *Calyx* pubescens; tubus 5–5·5 mm. longus, 2 mm. latus, cum costis de apice dentium decurrentibus; dentes subulato-spinosi, circiter 1·5 mm. longi. *Corolla* pallide lilacina; tubus glaber, 9 mm. longus; limbus glaber, ad 8 mm. diametro. *Stamina* filamentis brevissimis; superiora corollae tubo infra fauces ita longe affixa ut antherae

videri non possint. *Ovarium* glabrum; stylus glaber cum stigmate circiter 5 mm. longus.

Zapala: Cerro Lotena, on hot dry rocky ground, at 900 m., fl. October 14th, 1925, *Comber* 79. "Flowers strongly scented, especially at night. It flowers profusely like No. 78, and is more common and flowers later than that plant."

This species resembles *V. seriphioides* Gill. & Hook. and *V. echinata* Phil. in producing the inflorescences on very short lateral shoots in the axils of older leaves. The description of *V. hystrix* Briq., a name which cannot stand owing to the existence of *V. hystrix* Phil., reads very like *V. echinata* Phil., which is probably conspecific with *V. seriphioides*. The type of the latter has a facies very different from that of *V. dolichothyrsa*, having much shorter primary and secondary leaves, and shorter bracts. In contrasting his *V. hystrix* with *V. seriphioides*, Briquet says of the latter that the flowers are isolated at the tops of the branches. This shows how easily a totally false impression of the facies of a plant may be gathered from reading a short and vague description, for in this instance Briquet cannot have seen an authentic specimen. The fact remains that the degree of constancy in the characters of the young shoots and the different leaf-series, which give such a distinctive facies to these spiny species of *Verbena*, needs careful investigation in the field, before their true relationships can be settled in the herbarium.

Verbena (§ **Verbenaca, Pungentes**) **spissa** *Sandwith* sp. nov. [Verbenaceae]; affinis *V. caespitosae* Gill. & Hook., foliis primariis spinosis multo numerosioribus brevioribusque, secundariis multo minoribus densius rosulatis viridioribus glabrescentioribusque differt.

Frutex humilis, teste lectore 30 cm. altus et 30–90 cm. diametro; rami principales inferiores nudi, lignosi, crassissimi, 1–2 cm. diametro, apice pulvinum densum spinosum ad 14 cm. diametro gerentes; pulvinus e ramulis vetustioribus rosulis nigris foliorum praeteritorum densissime obtectis et e partibus novellis spinosis floriferisque compositus. *Folia primaria* quadrifariam disposita, subulata, valde spinescentia, brevia, 3–4·5 mm. longa, juventute pubescentia et ciliata. *Folia secundaria* in primariorum axillis ita densissime conferta ut axem ramulorum omnino occultent, ovata vel lineari-oblonga, 0·5–2 mm. longa, 0·3–0·7 mm. lata, pubescentia. *Flores* apud has rosulas gemini; bracteae ovatae, pubescentes et ciliatae, fere ad medium connatae, ad 2.5 mm. longae. *Calyx* dense breviter albo-pilosus; tubus ad 3·5 mm. longus; dentes ad 1·5 mm. longi sed vulgo breviores. *Corolla* alba; tubus glaber, 8–9 mm. longus, igitur e calyce satis longe exsertus; limbus glaber, parvus, 5–6 mm. diametro. *Stamina* filamentis brevissimis; superiorum antherae in corollae faucibus manifestae. *Ovarium* glabrum, 1 mm. altum; stylus glaber, cum stigmate 4·5–5 mm. longus.

Zapala: Cerro Lotena, at 900 m., fl. October 14th, 1925, *Comber* 78. "Found on the top of hot, dry, rocky ground, but not common. Flowers strongly-scented, white, yellowish on fading." It flowers profusely, earlier than *V. dolichothyrsa*.

This has the habit, geminate flowers and calyx of *V. caespitosa*, but parts company with it in other respects, approaching *V. seriphioides* in the dense black rosulate clothing of the old branchlets, which resembles that of *Nassauvia rosulata* Ball.

XXVI.—MISCELLANEOUS NOTES.

Mr. Hugh C. Sampson, C.I.E., B.Sc., formerly Director of Agriculture, Madras, has been appointed Economic Botanist at the Royal Botanic Gardens, Kew.

This appointment has been made in connection with the grant of £4,000 for five years which has been received from the Empire Marketing Board through the Ministry of Agriculture and Fisheries.

The grant will be devoted partly to the employment of the economic botanist, who will be available either to visit the Dominions and Colonies from time to time or to set free a superior officer of the Kew staff to undertake oversea missions, and partly to sending botanical collectors to various parts of the world to study and bring home plants of economic importance for cultivation at Kew and distribution to suitable parts of the Empire.

The close liaison which exists between Kew and the agricultural and botanical departments of the world has proved of great benefit to the Dominions and Colonies in the introduction of new staples and the development of the natural vegetable resources of the Empire. With the progressive opening up of new territories and the continual expansion of agricultural enterprise in the Empire overseas the need has arisen for a closer co-operation and a more direct service, and these the grant is designed to afford.

The following appointment has been made by the Secretary of State for the Colonies :—Mr. A. C. Barnes, Agricultural Chemist, Nigeria, to be Assistant Director of Agriculture, Zanzibar.

The Botanic Gardens, Singapore.—The recently published Illustrated Guide to The Botanic Gardens, Singapore, provides an interesting account for the resident and a useful guide and attractive souvenir for the visitor. It is dedicated to Mr. H. N. Ridley, C.M.G., F.R.S., and others to whose interest and work the Gardens owe their present-day reputation. The general arrangement of the description is centred round the chief features of the Gardens, and, whilst attention is drawn to plants of interest, the opportunity is taken to give notes on the history of the Gardens, the history and introduction of plants with records of their success or failure, and notes on economic products. The forty plates show

delightful views of the Gardens as well as illustrate some of the fine specimens of trees and palms which are such a noticeable feature. References throughout the text are to an accompanying plan specially marked to show the position of the subject. An Index to the plants mentioned, the different features of the Gardens, and the notes of economic interest, is a useful addition. The author, Mr. I. H. Burkill, who retired from the post of Director in 1925, is to be congratulated on his work, which is excellently produced. It is published at the modest price of one dollar Straits (2s. 4d.).

A New Economic Use for Ceanothus americanus.—An interesting article by Mr. E. H. Wirth, which appeared in the American Journal of Pharmacy for October, 1926, under the title "The Pharmacognosy of *Ceanothus americanus*," places this shrub before us in a new light. In Great Britain its usefulness has been estimated from a decorative rather than from an economic point of view, for, although it was known that its astringent properties led to its inclusion amongst the medicinal plants of certain tribes of N. American Indians, and that its leaves were used during the American Revolutionary Wars as a substitute for tea, it has never been regarded as a valuable economic plant. Used as a parent, with other species, however, it has produced a number of very useful and decorative summer and autumn flowering shrubs which are widely grown in gardens. Recent research reveals the plant from another standpoint, for it has been discovered that a drug prepared from the root bark possesses very distinct coagulative properties, and is valuable for the control of haemorrhage when administered orally.

C. americanus L. is a shrub $2\frac{1}{2}$–$3\frac{1}{2}$ feet high with a thick reddish rootstock and slender erect branches. The leaves are ovate, often $1\frac{1}{2}$–2 inches long and $\frac{1}{2}$–$\frac{3}{4}$ inch wide, but larger on cultivated plants; the flowers are small and white, and they are produced in terminal panicles from current year's shoots from June to September; the fruits are three-parted capsules, almost black when ripe, containing three hard seeds each. The plant is widely distributed in the Central and Eastern States of N. America.

In the article in question both plant and drug are described. The bark is stripped from the roots and appears in the market as short greyish or reddish-brown quills which break with a short fracture. During manufacture the bark is ground into a fine reddish-brown powder. The active principle appears to be starch and calcium oxalate which are found in varying quantities in different samples. One authority placed the starch at 1·87 per cent. and the calcium oxalate at 0·52 per cent.

From an economic point of view the following lines taken from the article are of particular interest. "The plant has recently become of special interest due to the discovery of new therapeutic properties. Taylor working with an extract of the root bark and

with the alkaloids extracted therefrom has shown the drug to have marked coagulative properties when administered orally.

"Groot reports an average depression of 41·8 per cent. in coagulation time in one group of thirteen pathological cases. He used an extract of the drug and a solution of the purified alkaloid. Tharaldson has discussed the blood reactions of the drug and confirms the work of Groot on coagulation. Payne cites 235 cases in which he has used the extract of the drug preoperatively to hasten coagulation and to control haemorrhage. Clark has determined that the alkaloids from the root bark, recently isolated by Taylor, are present as a complex mixture. He was able to isolate one crystalline alkaloid and also briefly reports an interesting resin-like substance. The recently discovered therapeutic properties are supposedly due to the alkaloids."

W. D.

A New Work on Trees and Shrubs.*—It has been known for a considerable time past that Mr. Rehder has had in preparation a book on Trees and Shrubs. This has now appeared and a copy has been presented to the Kew Library by the publishers, the Macmillan Company of New York. It is a single volume of 930 pages. The author has long been recognised as one of the leading authorities in America on trees and shrubs, and students have had previous opportunities of judging his capabilities by his contributions to Bailey's "Standard Cyclopedia of Plants" and his "Monograph of the Genus Lonicera." Of both these products from his pen those who have studied them have formed the highest opinion and have looked forward eagerly to the appearance of this more important work. It may at once be said that their anticipations of its value will be amply fulfilled. We have long admired Mr. Rehder's wide knowledge and qualifications as a botanist, his industry and the extreme care that characterises all his work. All these qualities are evident on every page of his book and there is no doubt that it will at once take its place as a standard work. Although primarily intended for the North American public, it will, being mainly descriptive, be of great value in this country, very many cultivated trees and shrubs, of course, being common to both countries. Notices of such genera as the New Zealand Veronicas and South American *Nothofagus* are not excluded, although probably they can be grown only in the warmer States.

The book commences with a "Synopsis of the Natural Orders and Families" under which the genera dealt with are included, their sequence being in accordance with the system of Engler and Prantl. It begins therefore with the Gymnosperms (*Ginkgoaceae*) and ends with the *Compositae*. A key to the genera of each Natural Family

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* Manual of Cultivated Trees and Shrubs Hardy in North America. By Alfred Rehder. Macmillan Co., New York, 1927, pp. xxxvii.+930. Price 42*s*. net.

is provided, also one to the species of each genus. Finally concise, but sufficiently full and adequate descriptions of all the species established in cultivation are given, together with abbreviated ones of little known or less important ones. They are arranged in the order of their relationship. From this it will be seen that a complete scheme is provided for the " running down " or identification of any given species.

In the main the work must be regarded as botanical rather than horticultural. The language is technical and it is unfortunate that gardeners and even educated amateurs will not go to the trouble of committing to memory the comparatively few botanical terms used in a work like this. Compared with what people term " plain English " such terms, of course, not only represent a great economy in paper and print, but express the meaning of the writer with a preciseness and exactitude impossible except by resorting to a wearisome length of phrase. Mr. Rehder says little or nothing about cultivation and propagation, but frequently gives some idea of the garden value of a species and a note regarding its most characteristic feature.

The value of a work like this can only be fully estimated by using it, but little foresight is needed to predict that the more it is used the more will one come to rely on it. It represents a great step forward in hardy tree and shrub lore.

With regard to nomenclature, Mr. Rehder in his preface observes that he has followed the International rules. After seeing what some American authors arrive at by following this and cognate processes, one opened his book with a shiver of apprehension. But, happily, with respect to genera at any rate, as the pages are turned over we see the familiar names appear.

Some of the larger genera as estimated by Bentham and Hooker are here split up into several, such as *Pyrus*, *Vitis* and *Spiraea*, and some of the smaller ones are given names different from what have hitherto been in common use, such as *Campsis* for *Tecoma*, *Meratia* for *Chimonanthus*, *Thea* for *Camellia*. Still, on the whole, Mr. Rehder has been mercifully conservative in his use of generic names.

With regard to specific ones we cannot feel so happy. We see many that are strange and unfamiliar. Take for example our chief English elms: the common one (*U. campestris*) becomes *U. procera;* the Wych elm (*U. montana*) appears as *U. glabra;* and the smooth-leaved elm (*U. nitens*) is disguised as *U. foliacea*. Consequently not one of the names in common use for our elms is adopted. With reference to our *U. campestris*, Mr. Rehder seems to stretch its limits as a species too far. What evidence is there, for instance, that *U. viminalis*, which he makes a variety of it, ever originated from *U. campestris*? It seems to me also very doubtful that the elm of S. Europe here called var. *australis* can be anything other than a distinct species. But these are controversial matters,

and differences of opinion about them do not detract from the general excellence of the work, which must have involved an enormous amount of labour. The author deserves our sincerest congratulations.

W. J. B.

A Garden in Wales.*—This volume forms a useful addition to the many works on gardens already in existence. The author has a good garden and shows that he has a real knowledge and deep insight into the flowers and shrubs which he so enthusiastically cultivates. The subject matter is written in a conversational and popular style and is free from technical terms, thereby making it pleasant reading. A great deal of valuable information can be obtained from the book on the laying out of a garden, and there are many hints concerning the planting and cultivation of the more delicate plants. The excellent illustrations either of the plants *in situ* or of small stretches of the garden itself add greatly to the attractiveness of this work.

M. L. G.

South African Poisonous Plants.†—In *Kew Bulletin* 1925, p. 37, Dr. Burtt Davy drew attention to the valuable research carried out by the botanical department of the Union of South Africa in the detection of native plants suspected to be poisonous to stock. This research showed that several plants were responsible, mainly those of the families *Rubiaceae* (*Vangueria*), *Compositae* (*Matricaria*), *Papilionaceae* (*Crotalaria*), and *Chailletiaceae* (*Dichapetalum*). Dr. Phillips has now provided a complete list of the known poisonous plants of South Africa accompanied by twenty plates, most of them in colour, with simple descriptions and a key for their determination. This forms No. 9 of the Memoirs of the Botanical Survey and should prove to be of great practical value to farmers and others whose interests are concerned in this important subject.

We record with great regret, as this number goes to the printers, the death on the 22nd March of Professor C. S. SARGENT, Director of the Arnold Arboretum, Harvard University. A notice of his contributions to arboriculture will appear in the next number of the Bulletin.

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* By A. T. Johnson. Edward Arnold & Co., London, 1927. 8vo. pp. 324, 19 illustrations. Price 16*s*.

† A Preliminary List of the Known Poisonous Plants found in South Africa, by E. P. Phillips, Botanical Survey of South Africa, Memoir No. 9, Govt. Printing and Stationery Office, Pretoria, 1926. Pp. 30, plates 20. Price 2*s*. 6*d*.

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